Vol. 9, No. 6 JUNE, 1954

AGRICULTURAL CHEMICALS

100 YEARS OF PROFESSIONAL ENTOMOLOGY



Asa Fitch of New York, first employee from a State to receive an official commission in 1854 for insect study.



Townend Glover joined the new U. S. Bureau of Agriculture in 1854 as the first federal entomologist.

1854-1954

In This Issue:

100 Years for Entomology • Bankers Role in Farming • Urea Herbicide Applications • Insecticide Resistance Problem
Chemafety • CFA Members • Barberry Eradication • APFC to Hot Springs • NFA Spring Meeting • Fert. Consumption Report



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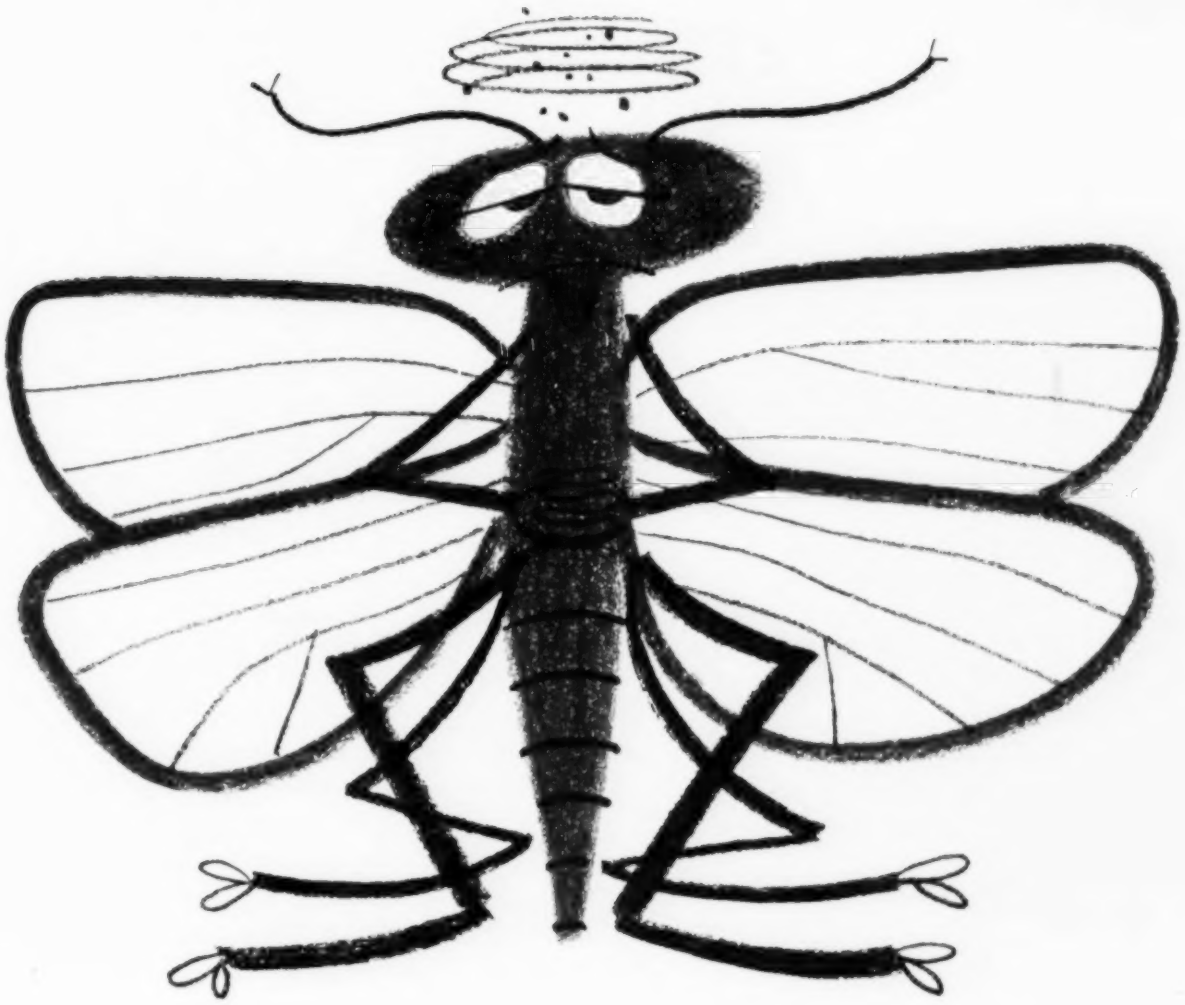
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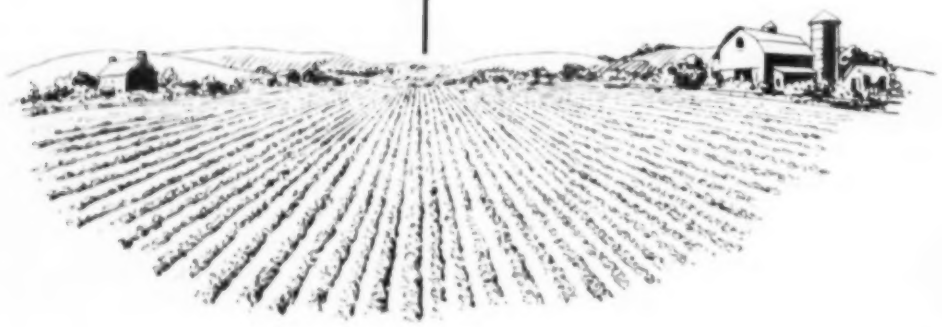
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AGRICULTURAL CHEMICALS

100 YEARS OF ENTOMOLOGY



T. GLOVER



A. FITCH

This Month's Cover

Townend Glover and Asa Fitch were pioneers who started the profession of entomology. They were the first two federal and state employees to draw pay for their work on insects,—back in 1854. This month we celebrate the completion of the first century of professional entomology in the United States.

JUNE 1954
Vol. 9 No. 6

In This Issue:

Editorials 39
The Banker's Role in More Efficient Farming 40
By Joseph A. Howell
A. P. F. C. Meets in Hot Springs 43
Applications of Urea Herbicides in Agriculture 44
By A. E. Carlson
A Report on the Insecticide Resistance Problem 46
By Dr. E. F. Knipling
Chemafety 48
By L. R. Gardner
California Fertilizer Assn. Members (Part III) 50
Natl. Fertilizer Assn. Meets 53
100 Years for Entomology 54
By Donald Lerch, E. O. Essig, H. H. Ross, H. H. Shepard, W. L. Baker, C. R. Neiswander and P. J. Chapman
Barberry Eradication 60
By R. Bulger
Fertilizer Consumption in the U. S., 1952-53 62
By W. E. Scholl & H. M. Wallace
The Listening Post 82
By Kelvin Dorward and Paul R. Miller
Washington Report 87
By Donald G. Lerch
Technical Section 91
Industry News 101
Industry Meeting Calendar 103
Classified Advertising 159
Advertisers' Index 163
Tale Ends 164

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A Monthly Magazine For the Trade

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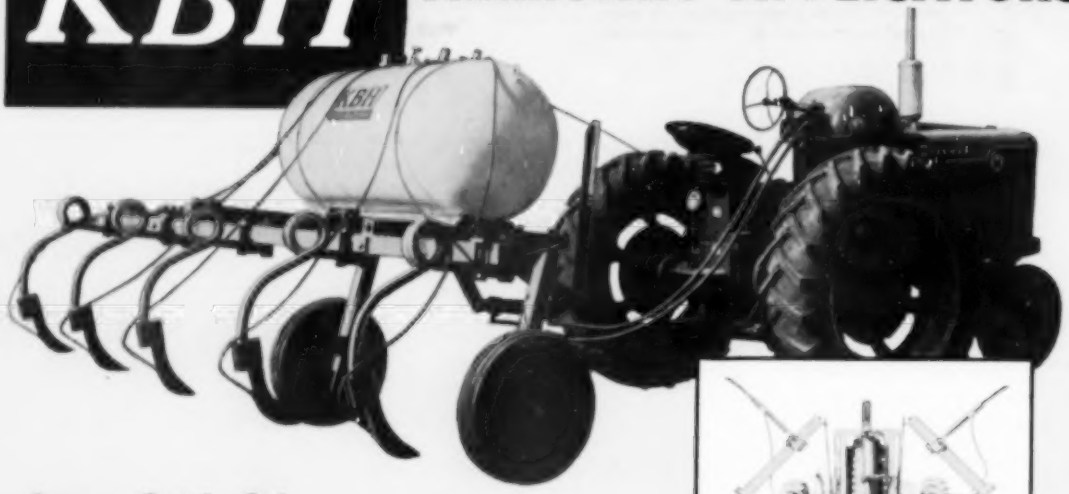
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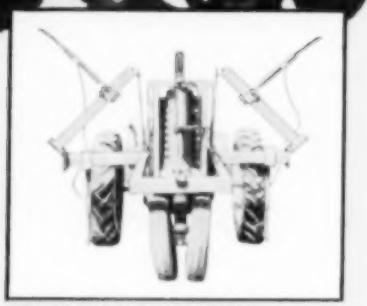
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GRADUATION . . .

It's graduation time on campuses all over the nation! You hear the college songs — see lines of bright faces set off with the traditional caps and gowns. These young people are thinking about the future — jobs and marriage.

We're glad to note that many business leaders are accepting invitations to make "the graduation address." The inspiration these leaders impart to graduates often makes lasting impressions. It's a tribute to both the man and his business to receive this honor. It's citizenship in action.

— "THE INDIAN"

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Dilution rate is only one of the important factors that need consideration in choosing the right emulsifier for a specific application. If you'll give us information on all the factors listed below, we'll be glad to suggest an Atlox® emulsifier or emulsifier blend that best matches your toxicant concentrate and the conditions under which it is used.

EMULSION DATA CHECK LIST

1. Toxicant used_____
2. Solvent used_____
3. For water hardness_____ ppm.
4. Recommended dilution_____
5. Lbs. toxicant/gal. of concentrate_____
6. Desired emulsion stability_____
7. Shelf life expected_____
8. Ease of dispersion important?_____
9. Packaging: bulk_____ or small container_____
10. How is concentrate mixed and evaluated in laboratory tests?_____

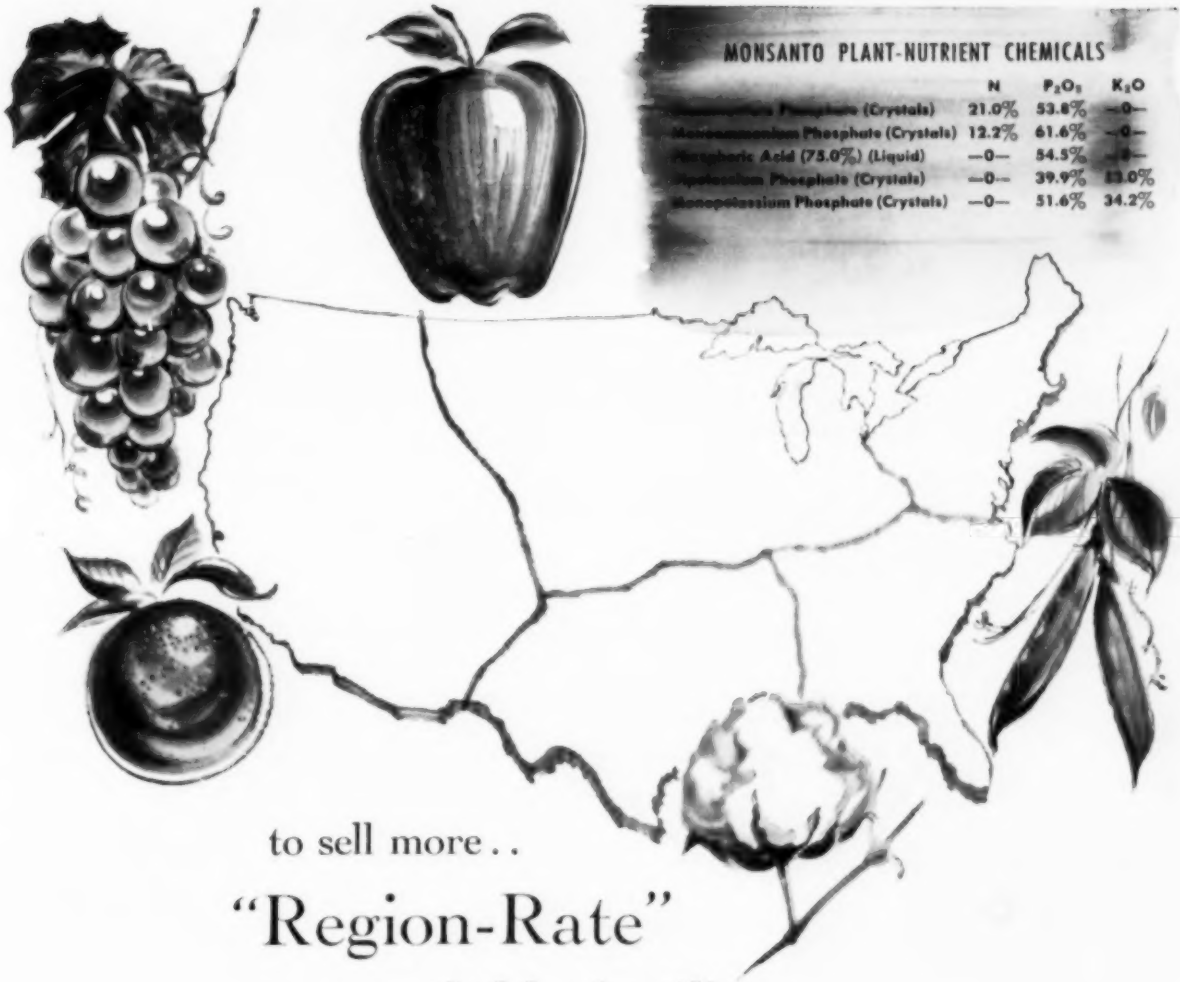
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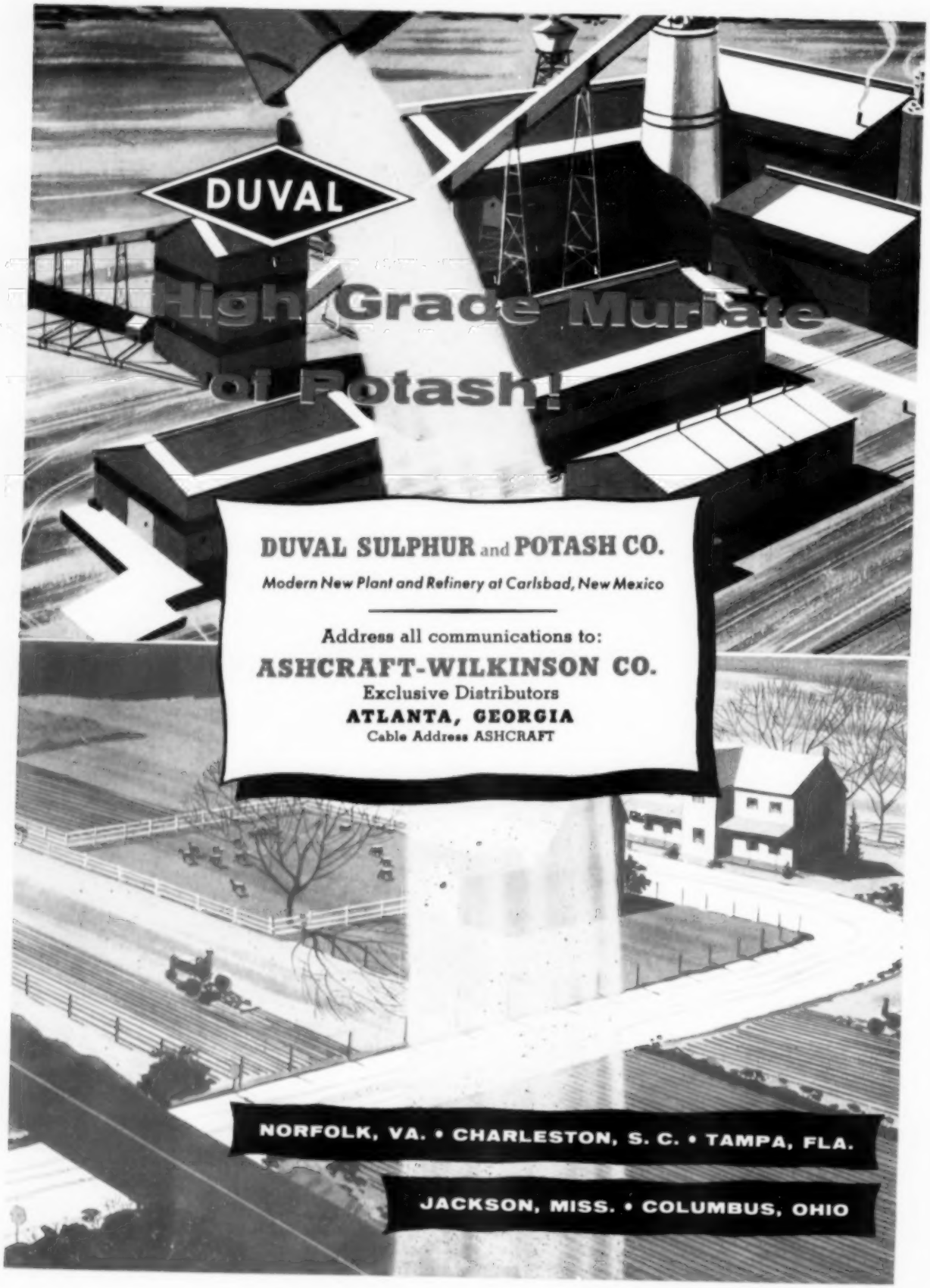
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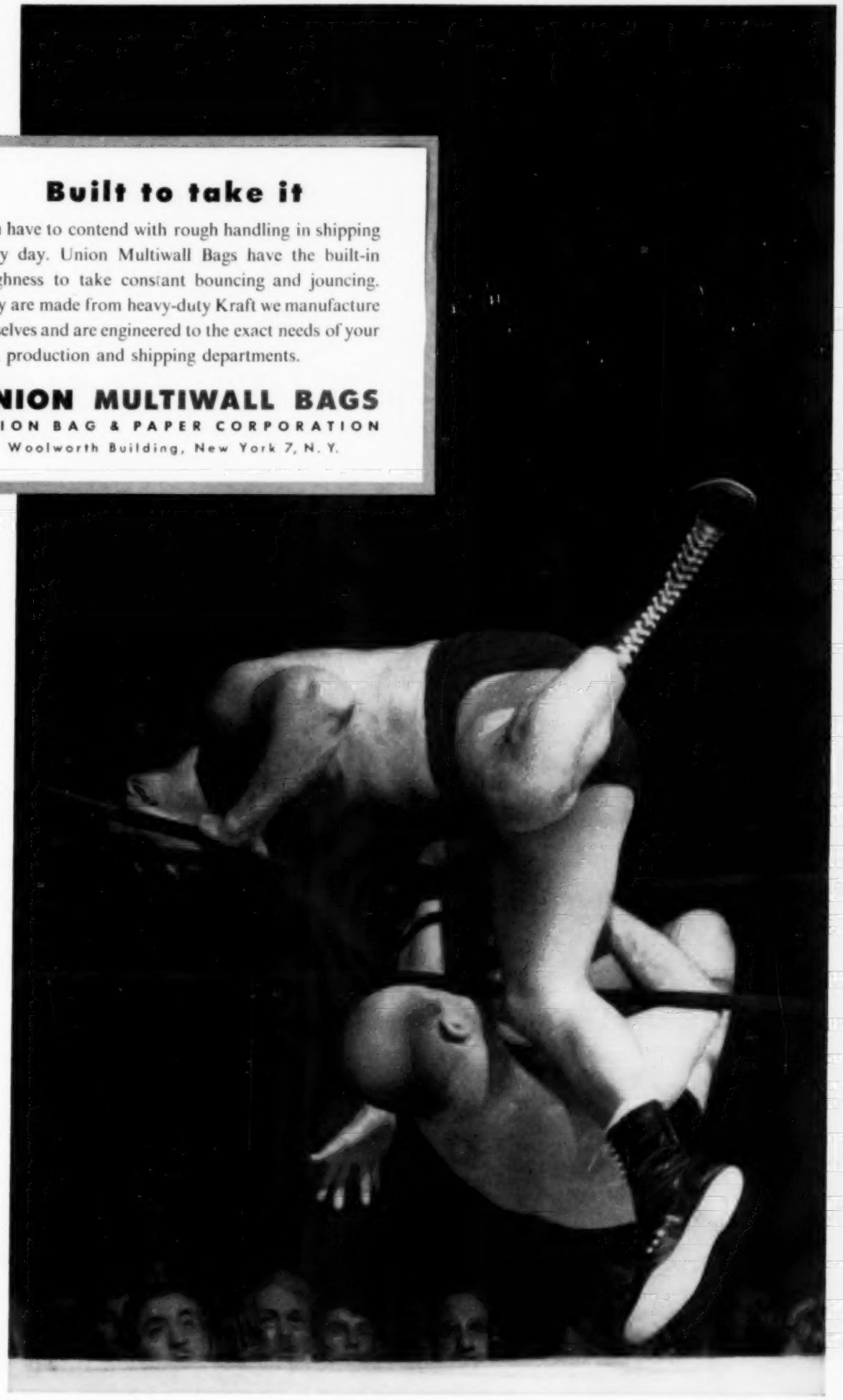
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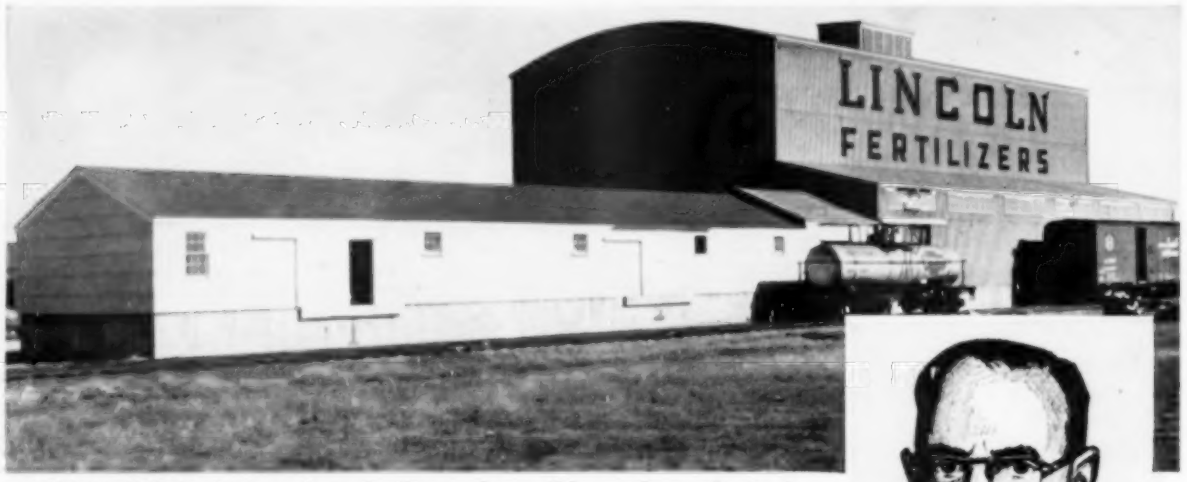
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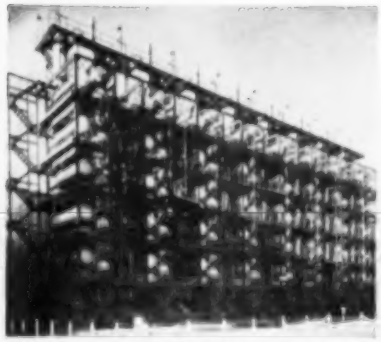


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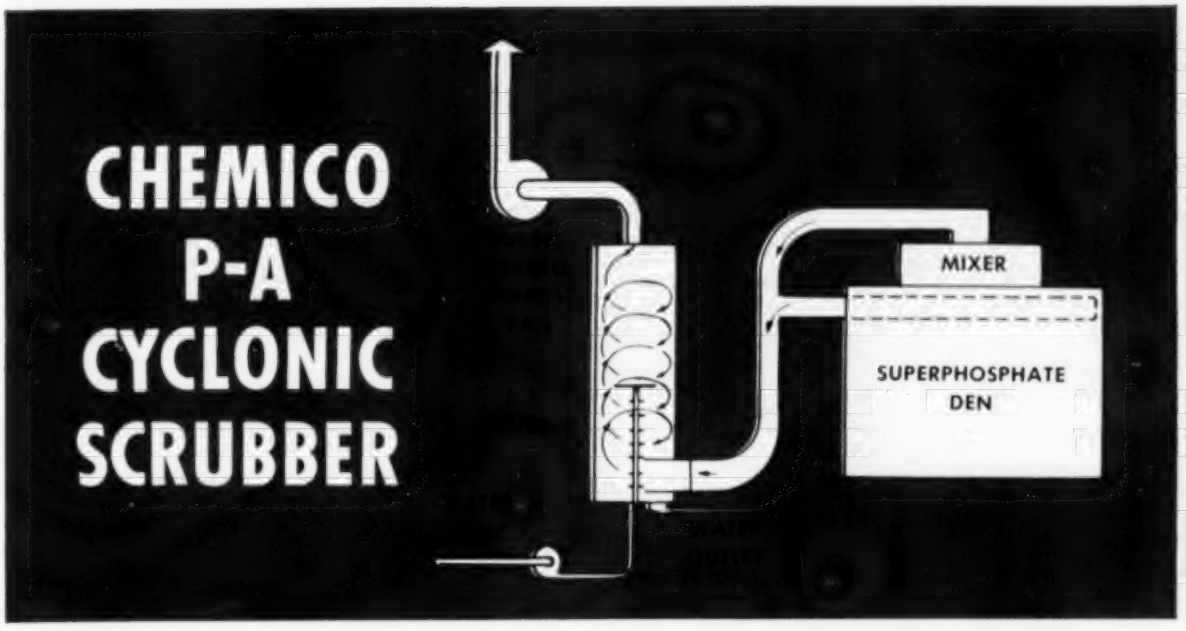
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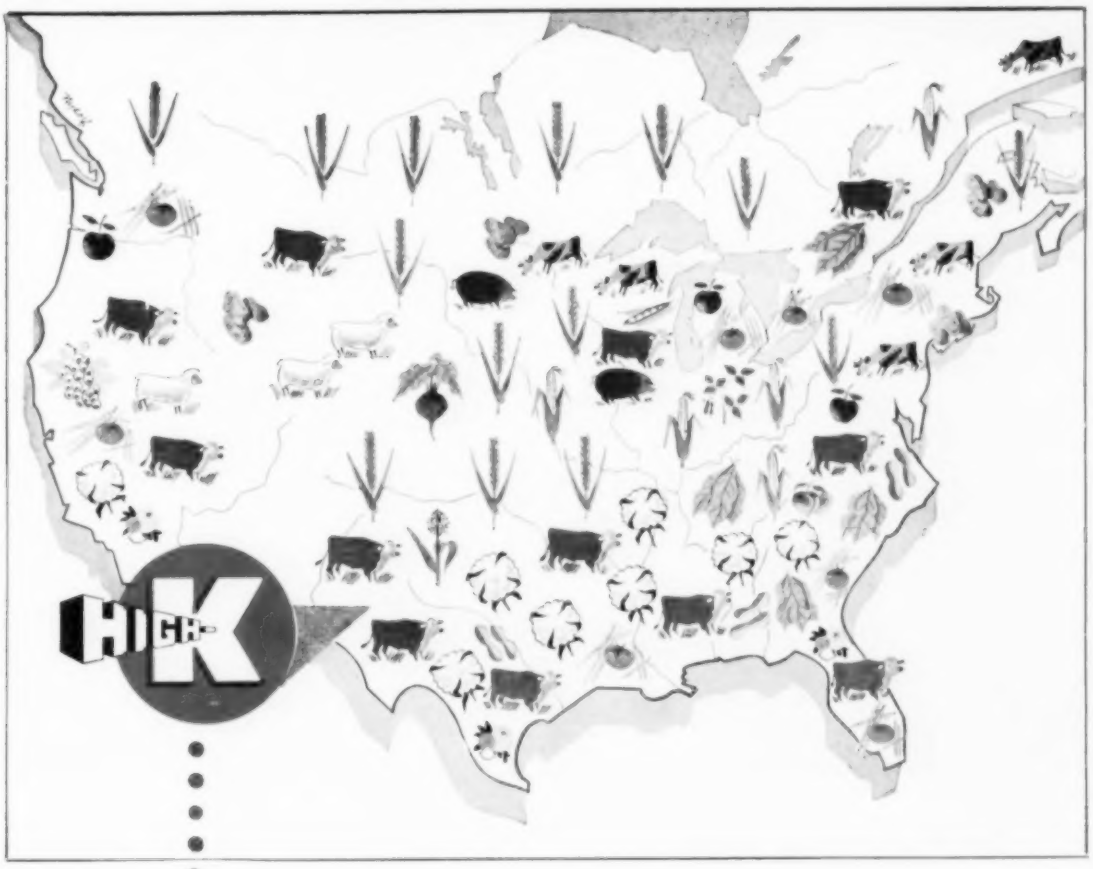
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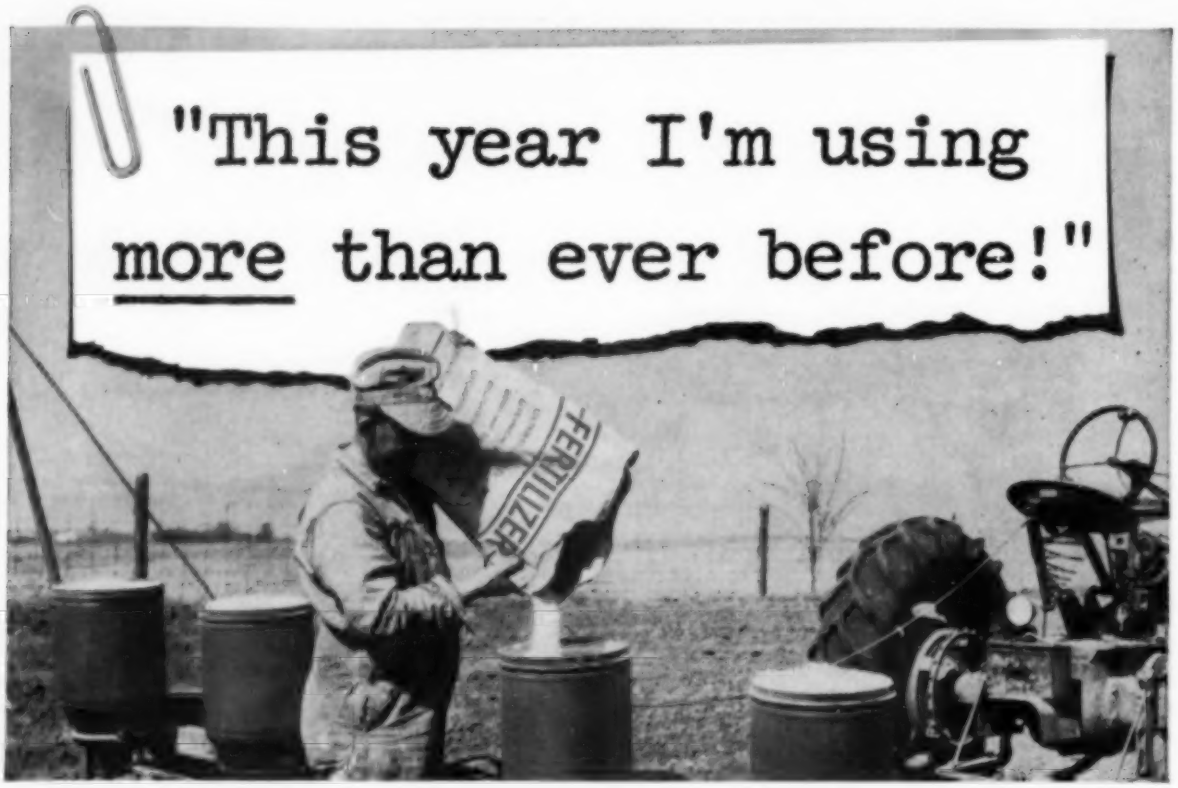
...by using modern mining facilities and up-to-date processes to produce HIGH-K* Muriate of Potash for plant food manufacturers.

Southwest Potash Corporation

HIGH-K Potash

*Trade-mark

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SEE YOUR COUNTY AGENT



Ask your County Agent to recommend the analyses and the amounts of fertilizers best suited to produce big yields of the crops you grow on your soil. His advice to you is based on the latest official recommendations from your Extension Service and Experiment Station.



SEE YOUR BANKER

Bankers are alert to good investments. They know that fertilizer pays a big return in the short period of a growing season. If you need money to buy more fertilizer, most bankers consider the extra yields produced by fertilizer as an excellent risk.

SEE YOUR FERTILIZER DEALER



Your fertilizer dealer can supply you with a good brand of fertilizer in the amounts and analyses as recommended by your county agent. Help your dealer to get your fertilizer to you on time by placing your order early and accepting prompt delivery. Use more fertilizer than ever before and have it on hand when you need it. Remember, fertilizer grows farm profits. Use enough to really pay you big!

This year many of the best farmers are using more fertilizer than ever before. With farming costs going up and farm profits coming down, they want the extra yields of high-quality crops that fertilizer adds to every acre at such low extra cost.

Figure it out for yourself. Your investment in land, labor, seed, machinery, insect control and other fixed expenses is the same whether your yields are high or low. When you double or triple your yield through the use of more fertilizer, you have two to three times as much crop income to carry your fixed expenses. Your only extra costs are the cost of the fertilizer and harvesting the extra yield. The extra yields added by fertilizer are the lowest cost and most profitable share of your crop. You are in better shape to make a good profit despite low crop prices, acreage restrictions and other conditions beyond your control.

If you grow corn, for example, do you know how many bushels per acre you have to produce to cover fixed expenses? In one state the break-even point is 40 bushels per acre. In another state it varies from 30 to 70 bushels per acre depending on the value of the land. If your break-even point is 40 bushels and your yield is 35 bushels, you've lost money. But, if you use enough fertilizer to increase your yield to 100 bushels per acre, you make a big profit.

First consideration should be given to the important economic fact that a bushel or a pound of any crop can be produced much more economically when the yield is high than when the yield is low. The yield per acre bears a positive relation to the cost of production and the yield is dependent on the fertility of the soil.

Fertilizer is your best investment. The price of fertilizer has not gone up like the prices of many other things the farmer buys. Fertilizer grows farm profits. Returns from thousands of tests show that $1 invested in fertilizer produces an average return of $3.75 in extra yields. On many crops the return is much higher. Put more fertilizer to work for you. It's your best answer to the present farm situation.

The fertilizer industry serves the farmer. Nitrogen Division serves the fertilizer industry as America's leading supplier of nitrogen for use in mixed fertilizers.

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FERTILIZER GROWS FARM PROFITS

AS WE GO TO PRESS . . .

Fertilizer Application Program Set

PESTICIDE-FERTILIZER mixtures, application of trace elements and an exhibit of fertilizer application equipment are featured on the program for an important fertilizer application conference, scheduled for September 6.

The cooperative program, to be held at the University of Florida, Gainesville, is being sponsored by the National Joint Committee on Fertilizer Application and the American Society for Horticultural Science.

Secretary Malcolm H. McVickar, of NJCFA, who announced the program late last month, said Dr. K. D. Jacob, head of the division of fertilizer and agricultural lime, USDA, would be the speaker on inclusion of insecticides, fungicides and herbicides in fertilizer. J. R. Beckenbach, associate director of the Florida Agricultural Experiment Station, will give the address entitled "How To Apply Trace Elements."

Also on the program will be talks by George B. Nutt, A. Lee Towson and A. L. Kenworthy, and a panel discussion on the problem "How To Make Research Work in the Field." Mr. Nutt, of Clemson Agriculture College, will deliver opening remarks as general chairman of NJCFA. "Where Are We Going on Fertilizing Horticultural Crops" will be the topic of a report by Mr. Towson, of Seabrook Farms Co., who is president of the Vegetable Growers Association of America, Inc.

Mr. Kenworthy, associate professor of horticulture, Michigan State College, will speak on fertilizing deciduous fruits. Serving on the panel will be J. D. Barnard, agricultural research consultant, Green Giant Co.; H. G. Gauch, professor of plant physiology, University of Maryland; E. S. Haber, head, department of horticulture, Iowa State College; J. A. Rigney, head, department of statistics, North Carolina State College and M. T. Vittum, associate professor of vegetable crops, New York State Agricultural Experiment Station. Charles H. Mahoney, director of raw products research Bureau, National Canners Association, will be moderator.

•

Carswell is CSC Director



T. S. CARSWELL

T. S. Carswell last month was elected a director of Commercial Solvents Corp., J. A. Woods, president, announced. Mr. Carswell, vice president in charge of the Biochemicals Division, joined Commercial in 1946 after 30 years experience in the chemical industry.

•

Blue Mold Found in Conn.

The first 1954 case of blue mold was reported in a Connecticut tobacco seedling bed as this issue went to press. Dr. Saul Rich, plant pathologist at the Connecticut Agricultural Experiment Station, said the case was reported in a bed near Simsbury. He said the disease has been spotted also in Massachusetts.

Weather conditions in Connecticut have been very favorable for plant infection by the blue mold fungus, according to Dr. Rich, who warned tobacco growers in the state to protect their seedlings by proper application of fungicides. Both the Connecticut and Massachusetts stations have published a pest control chart for tobacco beds with suggestions for control of blue mold.

Cotton Mechanization Meeting

Traditional methods of land preparation, planting and fertilizing cotton have been changed with introduction of new weed control chemicals and mechanical harvesting. A discussion of these innovations will be featured at the eighth annual Beltwide Cotton Mechanization Conference in Little Rock, Ark. July 28-30.

The practices will be included in a roundup of "Beltwide Progress, Needs, and Problems in Pre-Harvest Mechanization of Cotton," Claude L. Welch, director of the National Cotton Council's division of production and marketing, announced late in May. The Council is sponsoring the conference in cooperation with the University of Arkansas, farm equipment industry, and USDA.

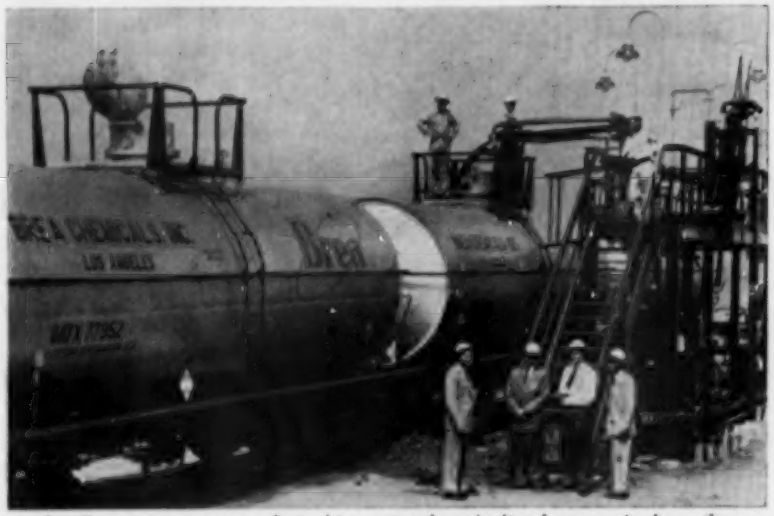
"Production practices such as chemical weed control and mechanical harvesting have altered the traditional pattern of land preparation, planting and fertilizing cotton," Mr. Welch pointed out. Efficiency of mechanical harvesting, he pointed out, demands smooth seedbeds, elimination of obstacles which could be picked up by harvesting machinery and damage it, and better control of weeds and grass.

Scarcity of farm labor and need for greater output per man-hour in cotton production has led to more intensive mechanization of land preparation and new techniques in planting and fertilization along with other advances, Mr. Welch noted.

He estimated that tractors today are used in about 90 per cent of the land preparation, and about 85 per cent of the planting. In some cases, where crawler-type tractors and four-row equipment is employed, only two days are required for land breaking chores which would consume a month's time for one man and a mule.

In planting, many cotton growers have turned to hill dropping, using a planter which releases the seed at intervals, rather than continuously, thus leaving space between the plants and eliminating need for thinning. With a four-row planter, mounted on a tractor, the mechanized farmer can plant his acreage about six times as fast as a man, mule, and one-row planter.

NH_3 Flows From Brea Plant



Loading crew prepares first shipments of agricultural ammonia from the new $13 million plant at Brea Chemicals, Inc., Brea, Cal. Brea is a subsidiary of Union Oil Co. of California. Full production of the fertilizer material is scheduled for the middle of this month. In the photo, from left: R. S. Ogilvie, plant superintendent; Robert S. Ray, manager of manufacturing; T. C. Henderson, operations superintendent and Jack Tielrooy, manager of development for Brea Chemicals.

Certificates for Nitrogen

In a readjustment of the nitrogen expansion program announced late in May, 13 applications for tax amortization certificates totaling 417,000 tons of nitrogen were approved by the Office of Defense Mobilization. Rejected by the office were 16 applications involving 694,000 tons of nitrogen.

Companies granted the certificates, the location of the facilities and the investments certified are as follows:

Allied Chemical & Dye Corp., Hopewell, Va., $7,800,000; Shell Chemical Corp., Pittsburg, Cal., $371,900; Dow Chemical Co., Freeport, Tex., $3,600,000; Columbia-Southern Chemical Corp., Natrium, W. Va., $3,030,000; Atlas Powder Co., Atlas, Miss., $6,750,000; Ammonia Chemical Corp. of California, Oleander, Cal., $4,000,000; Utah Chemical Co., Mount Pleasant, Utah, $18,725,000; Alabama By-Products Corp., Tarrant, Ala., $5,800,000; National Distillers Products Corp., Tuscola, Ill., $7,000,000; Columbia River Chemicals, Inc., Tasco, Wash., $10,251,000; Food Machinery & Chemical Corporation's Westvaco Chemical Division, South Charleston, W. Va., $2,503,000; Lange Bros., Inc., St. Louis, Mo., $12,100,000, and Northern Chemical Industry, Inc., Sandy Point, Me., $14,000,000.

•

Fertilizer Safety Group Meets

John E. Smith, Thomas J. Clarke, Curtis A. Cox, Vernon S. Gornto, C. J. Watts, Jr., John Mark, Charles W. Best and William C. Richardson, all members of the Executive Committee of the Fertilizer Section of the National Safety Council attended the President's Occupational Safety Conference in Washington on May 4, 5, and 6. While in Washington the representatives of the Fertilizer Section held several meetings to discuss work under way and future work objectives of the Fertilizer Section.

John E. Smith, Thomas J. Clarke, and Curtis A. Cox, members of the "Three Year Planning Committee" recently appointed by Vernon S. Gornto, General Chairman, held two lengthy meetings while in Washington and studied the many proposals for objectives to be incorporated in the Three Year Plan. John E. Smith, Chairman of the Three Year Planning Committee will submit the committee's report at the meeting of the Executive Committee being held at the Greenbrier Hotel, White Sulphur Springs, West Virginia on June 13.

Russell Coleman of the American Fertilizer Association and Louis Wilson of the American Plant Food Council met with the Planning Committee. Mr. Gornto stated that he felt confident the Committee would present a very practical and comprehensive report, which would in effect be a blue print of all the major activities which the Fertilizer Section plans on undertaking during the next three years. It is understood the Committee will give each objective contained in the Plan a priority rating, indicating just when it is anticipated the objective will be accomplished.

•

Synthetic Moves Office

Synthetic Fertilizers and Chemicals, Inc. has moved its main office to 511 Fifth Ave., New York 17, the company announced.

•

Plant Dedication Planned

Dedication of the cooperative nitrogen fertilizer plant at Lawrence, Kan. has been scheduled for Aug. 31, according to the Cooperative Farm Chemicals Association. Tours of the plant and a barbecue are planned. Production is scheduled to start in July.

•

Engs to Stauffer



WILLIAM ENGS

New assistant to the president of Stauffer Chemical Co. is William Engs, formerly manager of manufacturing of the Agricultural Chemicals Division of American Cyanamid Co. Mr. Engs joined Cyanamid in 1941 as technical coordinator of various war projects.

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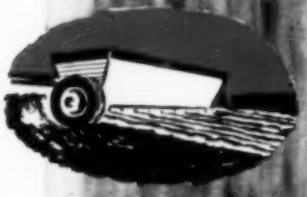
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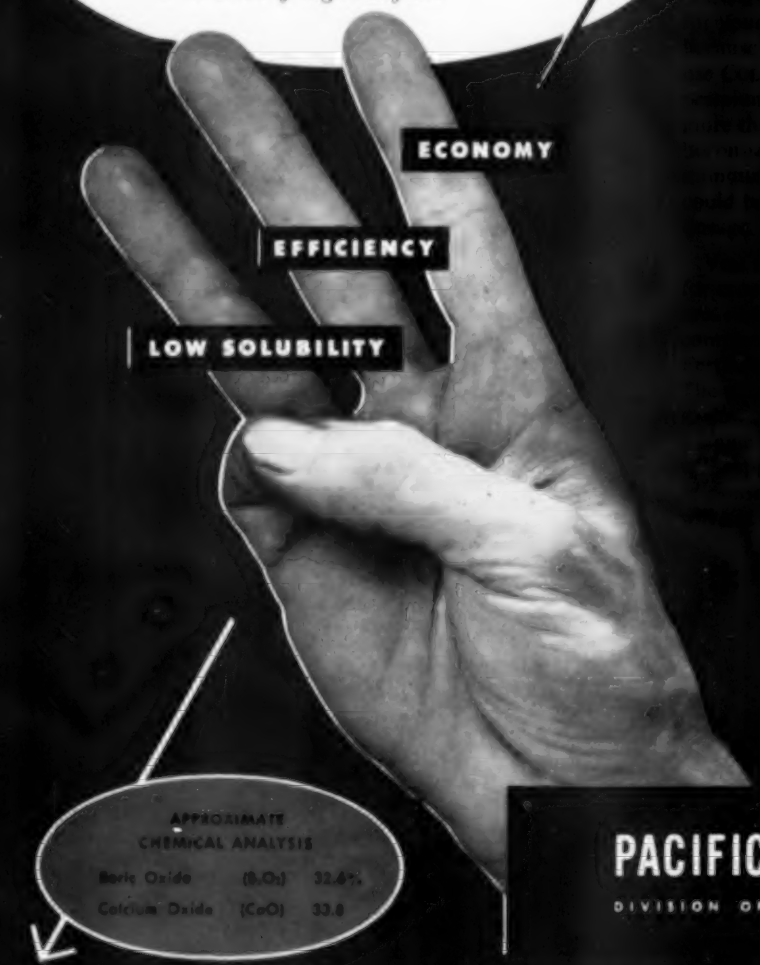
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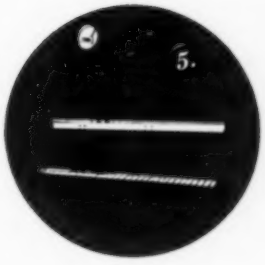
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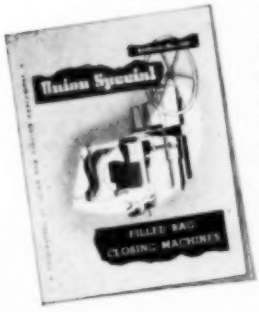
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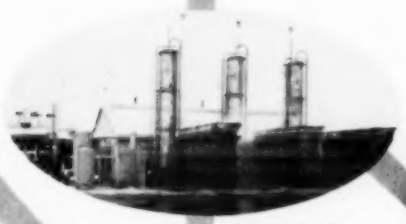

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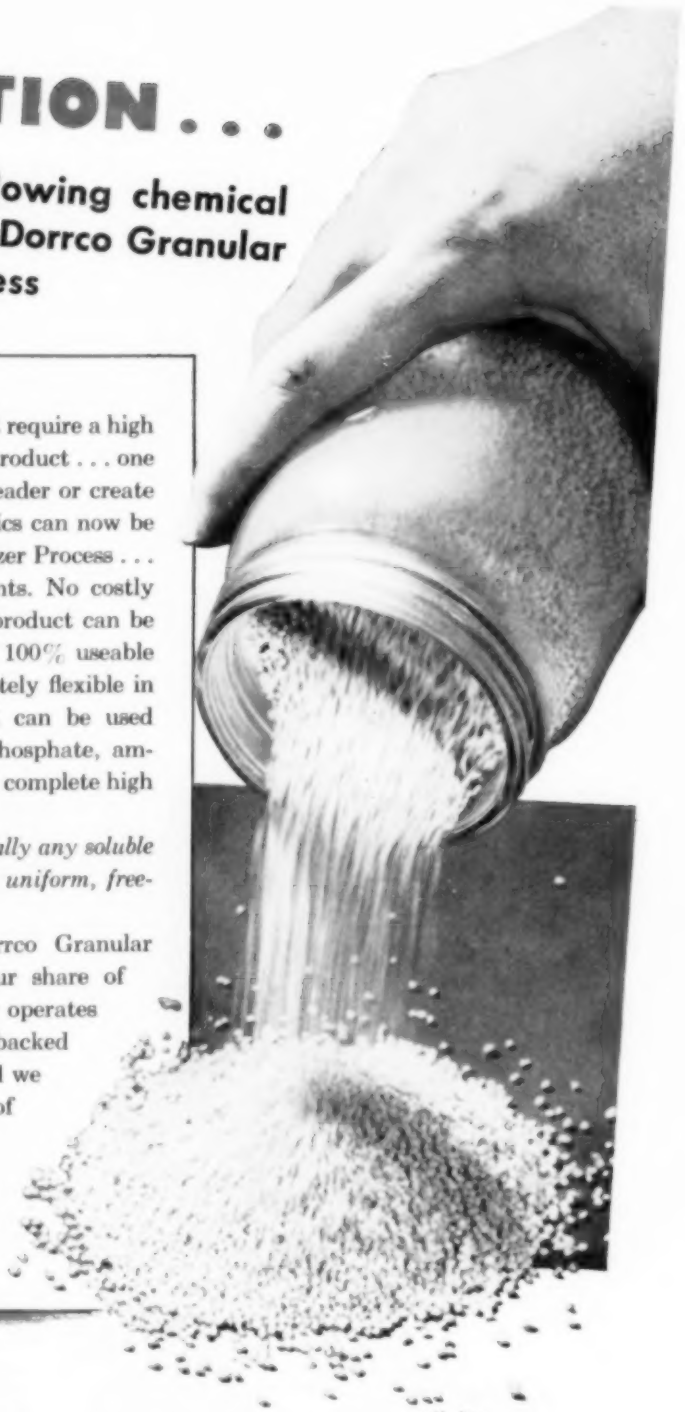
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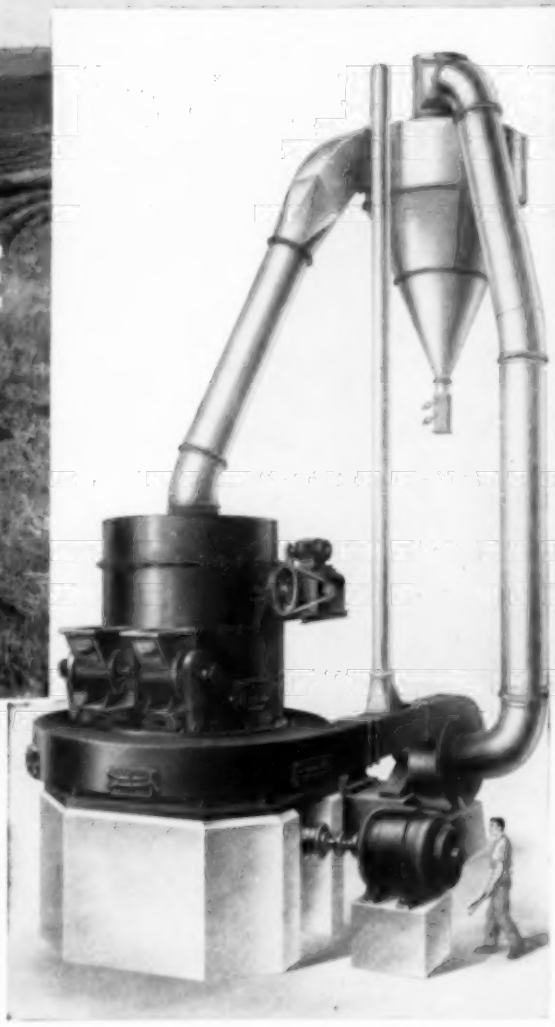
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*Trade-mark — †Also known as MALATHION

Editorial
COMMENTS

AS documented more fully elsewhere in this issue (See pgs 62-66) the American farmer set another record for the crop year 1952-53 in his purchase and use of fertilizer,—thus reiterating conclusively his belief that fertilizer is one of the best buys he can make. On a straight tonnage basis the increase in fertilizer consumption in 1952-53 as compared with the previous year, was 4.4%. In terms of primary nutrients consumed, however, the increase in fertilizer use was even more striking, with the 1952-53 total being 8.6% above that for 1951-52.

The full report well justifies close study by fertilizer manufacturers, dealers and distributors, for there is a great deal to be learned from the changing figures as to developing or continuing trends in the industry. For example, the disproportionate increase noted above in the use of primary nutrients, as compared with actual tonnage consumption, reflects the continuing trend in the direction of increased use of higher analysis fertilizers. Over the past ten years there has been a steady rise in the nutrient content of the fertilizers consumed. Average nutrient content was 20.58% in 1943-44, and in 1952-53 it had increased to 25.06%.

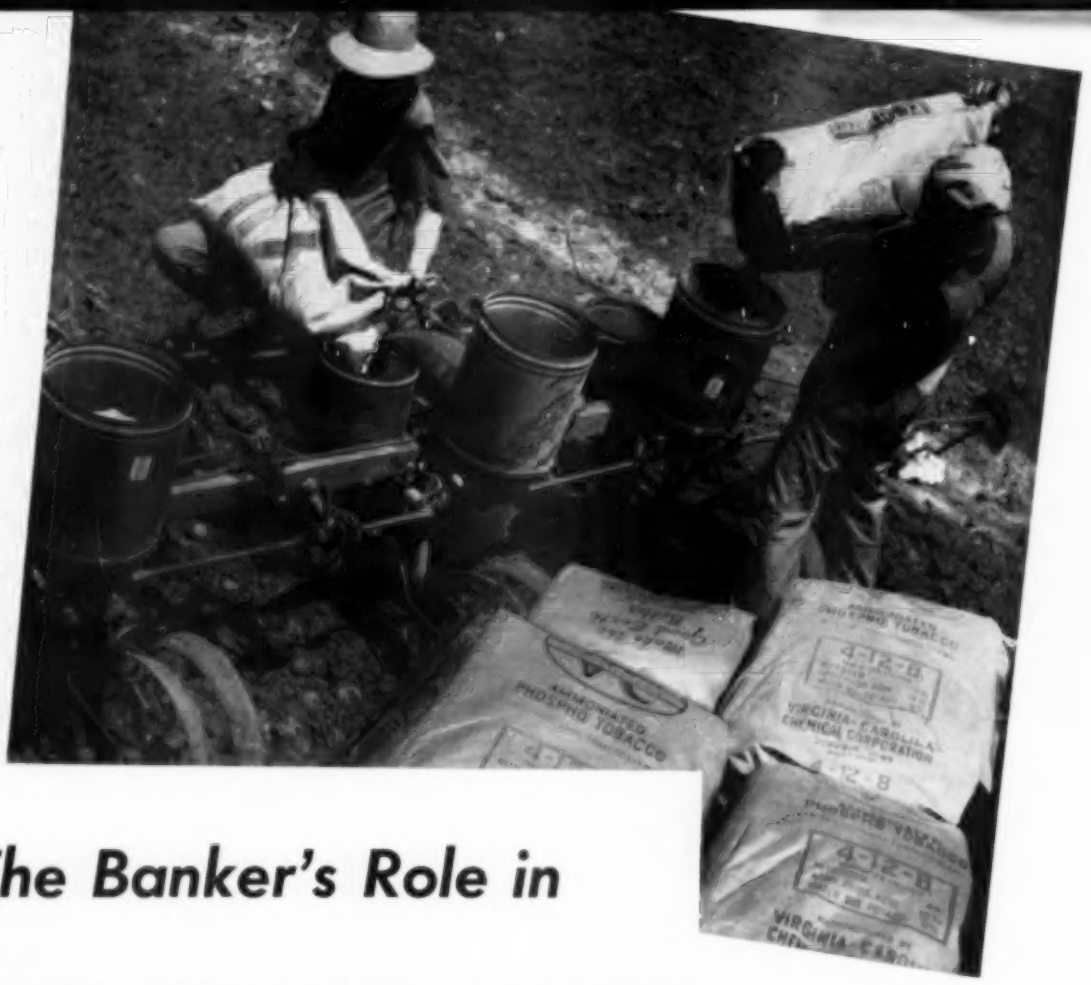
The latest USDA report also highlights a switch in emphasis on the various competitive fertilizer raw materials over the course of recent years. The swing toward increased use of anhydrous ammonia and ammonium nitrate-limestone mixtures is readily apparent. In the phosphates the swing is away from basic slag and normal super, toward ammonium phosphate and triple super. In potassium materials the movement is toward the more highly concentrated 60% grade of potassium chloride. Again in 1952-53 the weighted average primary nutrient content showed an increase for all classes of raw materials except the phosphates, reflecting increasing use of higher quality raw materials by fertilizer manufacturers.

Finally, the most recent report pinpoints once more the changing geographical pattern of fertilizer consumption. While the largest tonnage of primary nutrient fertilizers continues to be used in the South Atlantic region, the percentage increases in consumption this past year averaged highest in the West North Central region, followed by the East North Central, Mountain and Pacific regions. The swing westward and to the north from what was once the primary fertilizer market continues.

THERE are undoubtedly many of us around today celebrating the 100th anniversary of the establishment of entomology as a profession, who would not be here but for entomology. This relatively young science—and the commercial pesticide industry based on it—contribute two ways to making life longer and more abundant.

First, entomology has made a tremendous contribution toward boosting the world's food supply—which acts as an automatic control on population. Without the thousands of tons of added foodstuffs, which are traceable directly to effective pest control, the tremendous population gains of the past hundred years all

(*Continued on Page* 157)



The Banker's Role in

MORE EFFICIENT FARMING

THE tempo of banking interest in farming has been accelerating rapidly over recent years. Bankers have been active in promoting better farming, in better farm financing, and in making sound, but useful, loans for fertilizers, insecticides, pasture improvement, better seed, breeding stock and farm machinery, to mention only a few important factors in any sound land management program. The tie that binds the "Teller" and the "Tiller" has never been stronger than it is today.

Why has there been this increase in banker interest in farming? Bankers, first and last, are businessmen. Perhaps more than any other group they recognize the true paradox which today besets agriculture, our largest industry. Perhaps bankers more than others understand why we need a more efficient agriculture and why whatever efficiency we gain today will likely not be enough efficiency for tomorrow. Farming, as a business, must shed the shackles of war-time economy. It must meet the economic challenge of peace.

We may draw a parallel between: *demonstrated manufacturing efficiency* and *desired agricultural efficiency*.

Our industrialists and manufacturers of goods are the envy of the world. Perhaps no group in history is more responsive than they to the laws of supply and demand. The demonstrated efficiency of American manufacturers is without parallel in American history. It's a story we often take for granted, however. There is a lesson to be learned in terms of the industrial viewpoint of the law of supply and demand in relation to some segments of our agricultural economy.

Fertilizer — used profitably—offers perhaps the biggest single yield-boosting practice available to mid-West farmers.

Like efficient businessmen, the efficient farmer will survive. Yet, under wartime production incentives, we must concern ourselves with the inefficient farmer whose production too often only adds to our surpluses. The challenge ahead to those of us having farmers as our customers is particularly great in the light of this observation by one of our leading economists who reports that about 10 percent of the farms produce 50 percent of the products sold by farmers. The challenge is brought

closer home in a large area in which my own company operates when we view the disheartening statement that farmers in the South are using only half as much fertilizer as their Experiment Stations say they could use, and use profitably.

Fertilizer-Farmer's Most Productive Tool

THEY are making this inadequate use of fertilizer in the face of the demonstrated fact that fertilizer on a dollar for dollar basis, is one of the most productive tools the farmer has available to him. The statement was recently made at Iowa State College that "Fertilizers—used profitably—offer perhaps the biggest single yield-boosting practice available to mid-West farmers. But many other factors are associated with an increase in production".

By John A. Howell
President
Virginia-Carolina Chemical Corp.
Richmond, Va.

Based on an address before Iowa Bankers Association, Dubuque, Ia., May 18, 1954

In viewing the desired agricultural efficiency of our farmer, let's consider a recent (1950) appraisal by agricultural scientists of the Iowa productive capacity: At that time they estimated the maximum sustained production in Iowa that would be possible with full application of the known technology of 1950. And they estimated that Iowa, the Corn State, could average 85 bushels of corn per acre, as compared to an average base period of 50 bushels; 65 bushels of oats, as compared to 39; 30 bushels of soybeans, as compared to 22.

They estimated an attainable average corn yield of 60 bushels by 1955, and that would require more than five times the 1950 consumption of nitrogen, two-and-a-half times the 1950 consumption of phosphate and twice the 1950 consumption of potash.

Fortunately, for the farmer, and for all of us who consume the crops that he produces, fertilizer is considerably cheaper today than it was 15 years ago, in terms of the purchasing power of major farm commodities.

In 1939-41 it took 45 *bushels of wheat* to buy 1 ton of 3-12-12 fertilizer, but in 1953 it took only 26 *bushels* to buy that ton.

In 1939-41 it took 56 *bushels of corn*, but in 1953 it took only 36 bushels.



	1 ton 3-12-12 1939-41	1 ton 3-12-12 1953
Soybeans	33 bushels	19 bushels
Oats	105 bushels	69 bushels
Beef	458 pounds	299 pounds

These facts were revealed recently by the Mid-West Soil Improvement Committee in an analysis of prices received by farmers for their products and the prices they paid for fertilizer in 1953 and in 1939-41. It is readily apparent then that fertilizer is today's biggest bargain on the farm!

Fertilizer Just One Factor

LEST it be thought that we in the fertilizer industry hold the view that fertilizer is the panacea of *all* our economic ills in farming, let me hasten to add that we recognize fertilizer as only one of the important factors entering into a sound land management program. Sound land management means better risks for bankers. Without it, regardless of collateral to the note, your risk is much greater. In short, we have to make adjustments. No longer can we subsidize marginal acres, inefficient farmers, slack production methods—all of which produce surpluses and depress prices.

In farming, we must follow the lead of the manufacturers of the Nation. When over-production looms large, output is cut back—only, of course, after intensive sales efforts have been exhausted. The manufacturer, in general, not having the market for his goods propped up by price supports, produces only the amount he can sell.

Farmers must follow this example. And, while they are farming fewer acres more efficiently—while they are lowering their unit cost of production, they must—year by year—increase the total output of food and fibre to meet the needs of an ever growing population. To be sure, we must have more of most agricultural products and less of only a few. Gone are the insatiable demands of a war economy. The transfer to peace time is in progress. True, farmers have many problems crying for solution. The battle for efficient production must be fought constantly—high cost production acres in time of low selling prices should and must be diverted to building for the future by applying sound soil building practices rather than farmed for cash crops. For many years the marketing of agricultural products has been neglected, but now this problem is being given special study by the Department of Agriculture. More emphasis is being placed on selling agricultural products at home and abroad. Only recently Secretary of Agriculture Benson said: "I am thoroughly convinced that most of agriculture's present problems can be met through research and education and improved marketing methods". I am in complete agreement with this statement.

Let us all resolve now to take a bigger part in helping solve these problems. If this generation has learned one economic lesson it is this: empty pocketbooks on the farms do not turn the wheels of industry. As agriculture prospers, so fares the nation.

Wanted—More Efficient Farming

MOST of us agree that farming is rapidly developing more efficiency, but we will need still more efficiency to meet the needs of tomorrow. How are we to get more efficiency?

In the main, by farming to lower unit costs, to produce more on fewer acres, with less overhead costs, with less direct costs, with fewer people on farms. Every individual even remotely related to agriculture should embark on a crusade to encourage farmers to put into practice the results obtained from scientific research at our State Agricultural Colleges and at Federal and State Experiment Stations.

The Iowa State Agricultural Experimental Station incidentally, has been outstanding in its contributions to more efficient agriculture over the years, and has done much for the agriculture of the nation. Without the new disease resistant varieties of oats developed by Dr. H. C. Murphy and his co-workers, there probably would be very little oats grown in Iowa and neighboring states today. These new varieties yield 10 bushels more than those grown just 10 short years ago. On Iowa's 6 million acres of oats, this means an added 60 million bushels, worth about 80 million dollars.

Soybean yields in Iowa have doubled since 1935, thanks to better yielding varieties, and better production methods. In 1951, this added production supplemented farm income by 9 million dollars.

Intensive swine nutrition research showed that feeding vitamin B_{12} saved 7 percent of the feed bill, and produced 19 percent faster gains. This is about $1.20 saving per hog, and amounts to 24.5 million for Iowa farmers.

Antibiotics were also shown, in work done in Iowa, to effect added savings in feed, and to boost gains. Under average Iowa conditions, antibiotics reduce feed consumption 5.5 percent and increase gains 10 to 20 percent. When vitamin B_{12} and antibiotics are fed together, much less protein is required by the hog. This method of feeding saves $2 a year on each hog, or over 30 million dollars for the State.

This discovery alone, in just one year, saves more than twice the sum of all the money that was appropriated for agricultural research by the Iowa State Legislature in the 15-year period beginning June 1, 1939, and ending June 30, 1953.

To Improve Banker-Farmer Relations

NOW, let's turn to some suggestions for the improvement of banker-farmer relationship. In offering these ideas, I have looked over the promotional programs of the American Bankers Association, of various state banking organizations, of individual banks, and I have drawn on my own banking experience. Here are eight points I should like to submit:

1. Develop an outside-the-bank program for agriculture, either with a full-time employee or at least a part-time employee with an agricultural background.

2. Know the agricultural leaders personally in the area served by your bank.

3. Build a reputation in your community as a banker in support of sound agricultural programs for the improvement of agricultural income and rural living. Support means more than "lip service" or sending your agricultural representative to meetings of farmers where agricultural and economic problems are being discussed.

4. Provide credit facilities tailored to the needs of farmers in the community in which you operate. Present day farming is more than "a way of life". It is a big business and requires capital!

5. Personally support your land-grant college, and that does not just mean an annual visit with the president of the college, but it does mean knowing the specialists in the extension service and having a working knowledge of the experiment station and the contributions of each to a healthy agriculture in your community.

6. Insofar as possible, make your farmer-customers cognizant that the banker-farmer relationship affords both individuals an unusual opportunity to work together in strengthening the nation's private enterprise system of which both the banker and the farmer are integral parts.

7. Actively support and contribute to the success of your community's 4-H Clubs and Future Farmers of America chapters, for these young men and women not only are tomorrow's agricultural leaders, but they are among the best risks that your bank will have in investing in the future of farming.

8. Concern yourself with the return on investment in the agricultural education research programs of your land-grant college. When the occasion justifies, let the Legislature know that your experiment station, your extension service and your vocational-agricultural teachers need financial support commensurate with the services they are rendering the community, the country and the state. Take your interest in dividends from research a step farther and urge your rural merchants who deal with your bank to become a party to promoting the recommendations of your agricultural leaders, both in the field of education and research.

We, as members of the fertilizer industry, do not minimize the influence of the fertilizer dealer, but we prefer to maximize the importance of following the experiment station or extension service advice in the field of scientific farming. Without being critical, I am convinced we are getting an excellent return for the dollar we invest in research; but where we often fail in our duty is in getting our customers to follow these recommendations that have been proven in the field and in the laboratory to be economically sound.★★

Benson, Hoeven, Eleazer, James, Andrews Speakers at 9th Annual Meeting of the

American Plant Food Council

THE ninth annual convention of the American Plant Food Council will be held June 10-12 at the Homestead, Hot Springs, Va. Ezra Benson, U. S. Secretary of Agriculture, will be the featured guest speaker. Reports on farm equipment, public relations, farm economics, and other agricultural problems are to be discussed. The full program follows:

THURSDAY, JUNE 10

Registration

4:00 P. M. Ladies' Tea

9:00 P. M. Meeting of Board of Directors

9:00 P. M. Game Night

FRIDAY, JUNE 11

9:45 A. M. Opening of Convention

Invocation
The Reverend D. F. Helm, Minister, Hot Springs Presbyterian Church

In Memoriam Resolution
M. S. Wright
Chairman, Memorial Committee

10:20 A. M. Agricultural Public Relations Forum
"Improving Agricultural Public Relations and Information to Farmers"

Moderator
Robert H. Reed
Editor, "Country Gentleman"

"Some New Efforts to Improve Agricultural Information"
Stanley Andrews
Managing Director, National Project in Agricultural Communications (Kellogg Foundation)
Michigan State College

"How to Talk to Farmers"
J. M. Eleazer
Extension Information Specialist
Clemson Agricultural College

"Suggestions for Improving Agricultural Public Relations and Information to Farmers"
Ed Lipscomb
National Cotton Council of America

11:35 A. M. Presentation—Soil Builders' Award
Louis H. Wilson

Afternoon
Golf and Tennis
Ladies' Events

9:00 P. M. After-Dinner Reception
Courtesy....Southwest Potash Corp.

SATURDAY, JUNE 12

9:45 A. M. Convention Called to Order

9:50 A. M. Address
"The Farmer and Congress"
The Honorable Charles B. Hoeven
Chairman, House Subcommittee on Fertilizer and Farm Machinery

10:20 A. M. Address
"Food, Fibers, Fears and Facts"
The Honorable Ezra Taft Benson

10:50 A. M. Address
The Agricultural Economic Outlook
Dr. H. B. James, Head Department of Agricultural Economics N. Carolina State College, Raleigh, N. C.

11:20 A. M. Annual Business Meeting
Reports of Committees
Credentials Committee
Nominating Committee
Election to Board of Directors

Afternoon
Golf and Tennis

6:30 P. M. Hospitality Hour
Courtesy....Potash Co. of America

7:45 P. M. Banquet and Entertainment

9:30 P. M. Address
"An Editor's Thoughts"
Dr. Paul D. Sanders
Editor, "The Southern Planter"

10:30 P. M. Dancing

COMMITTEES
for the 1954 American Plant Food Council Convention

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W. T. Wright, Chairman
H. M. Albright — Edwin Pate
W. B. Copeland — P. J. Prosser
J. F. Doetsch, ex officio

Nominating
R. R. Hull, Chairman
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Credentials
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Clemson Agricultural College



H. B. JAMES
North Carolina State College



E. TAFT BENSON
Secretary of Agriculture



Applications of Substituted Urea Herbicides

Author's Note: In May, 1953, "Agricultural Chemicals" carried an article on "New Developments in Herbicides" by R. L. Lovvorn and W. C. Shaw of the USDA. Among other things, those authors said: "In 1945, hardly any investigator would have believed it possible to develop a chemical with greater herbicidal potency than 2,4-D. Yet in less than five years we have but to witness the herbicidal activity of the substituted ureas. This development indicates that we have accomplished an objective which many thought impossible." The Du Pont Company has adopted the trade-mark "Karmex" to identify agricultural herbicide formulations of substituted urea compounds. This article summarizes practical applications of these materials to date in American agriculture.

THE development of the substituted urea herbicides has brought into being a group of chemicals, effective at low rates of application against a remarkably wide range of weed species. Certain members of the family are the first organic herbicides which persist in the soil long enough to be used successfully for "soil sterilization", where it is desirable to keep the ground free of vegetation for an extended period. The first commercial formulation in this family was introduced for "soil sterilization". Examples of such applications include weed control in railroad yards, oil tank farms, security fencelines, power stations, fuel storages, and lumber yards.

Cropland uses for the urea herbicides depend on variations in susceptibility of different plant species and proper timing of applications. "Karmex" W herbicide, a wettable powder formulation of 3-(p-chlorophenyl)-1,1-dimethylurea, is now being used commercially for weed control in sugar cane, pineapple and asparagus. "Karmex" DL, a liquid suspension formulation of 3-(3,4-dichlorophenyl)-1,1-dimethylurea, is being sold on a limited introductory basis to cotton growers in the southeastern Piedmont and the Mississippi Delta.

Much credit is due to state and federal investigators and leading growers who have cooperated in the painstaking comparisons and have pooled the knowledge obtained to permit the most rapid introduction of these new herbicides consistent with good agricultural practice.

Cotton Weed Control

BECAUSE of the economic importance of chemical weed control in cotton, there is a good deal of interest in the program by which "Karmex" DL is being introduced into commercial use in some cotton growing areas.

Test work beginning in 1951 indicated that compounds in the substituted urea family would be especially suitable for weed control in cotton. Small-scale field trials led to a carefully supervised program of grower trials in eleven states in 1953.

These tests confirmed previous experimental evidence that "Karmex" DL herbicide would give good control of weeds in cotton.

With this success, the next step has been to go into limited commercial production, so that at least a small amount of the material could be sold this year in the southeastern Piedmont and the Delta where last year's grower trials have provided a basis for practical recommendations. Similar grower trials are under way this year in the Coastal Plain and irrigated cotton areas.

Sugar Cane

IN Hawaii, pre-emergence treatment of sugar cane with "Karmex" W herbicide as a pre-emergence spray has given outstanding control of annual weeds when applied at a rate of four pounds of active ingredient per acre, immediately following planting of the cane. Its use for that purpose is rapidly increasing. This type of treatment has given 90 per cent or better weed control for a period usually ranging from five to 21 weeks, with no apparent injury to the crop. However, application of "Karmex" W is not recommended at dosages higher than five pounds per acre (active ingredient basis) at one time, and the total amount used on any one cane crop has been limited tentatively to seven and a half pounds per acre. Test work is also underway in Louisiana.

Pineapples

SCREENING tests with substituted ureas for pineapple weed control began in Hawaii in 1951. The product now known as "Karmex" W herbicide showed excellent promise in these and subsequent tests, when applied as an over-all boom spray over pineapple plants right after planting. At four pounds per acre it controlled the emergence of seedlings of most species of weeds found in pineapple fields.

Further tests and field experience have led some commercial plantations to expand their treated acres to study usage of "Karmex" W on a field scale.

Asparagus

DEVELOPMENT of aspargus recommendations has followed a similar pattern—careful field testing, supervised grower trials, and analytical tests to assure safety to consumers.

Dosage and Equipment

CONCENTRATION of "Karmex" herbicides for crop application has presented some application problems, because the formulations are a wettable powder and a

By A. E. Carlson
E. I. du Pont de Nemours & Co.,
Wilmington, Delaware

liquid suspension. Five to six pounds per acre for sugar cane in Hawaii is the highest concentration recommended. As little as one to four pounds per acre for application to asparagus and four pounds per acre for pineapple are typical recommendations for "Karmex" W, the wettable powder formulation. "Karmex" DL, the liquid suspension, is being recommended for cotton in certain areas at three pints in 40 gallons of water for an acre on a blanket spray basis, or about one pint when application is made on a "band" basis.

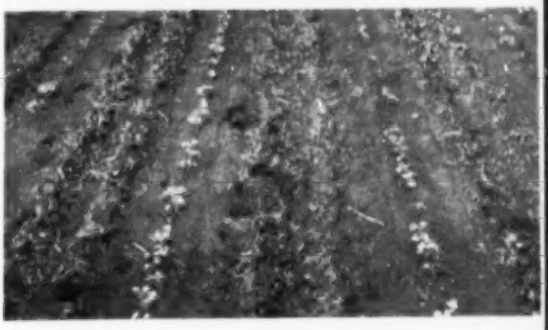
Wettable powder and liquid suspension formulations have proved necessary because of the low solubility of substituted urea compounds in water and in common organic solvents. Since most agricultural herbicides are either emulsifiable liquids or water soluble products, commonly-used spray equipment has required some adaptation before it can be used for applying wettable powders. Before adaptation, these weed sprayers usually have little or no agitation. Small nozzles protected by fine screens have been used to permit the application of small volumes of liquid per unit area. Lack of agitation results in settling out. Strainers and screens plug up, and sediment may collect in large diameter spray booms at low rates of flow.

For crop application of wettable powders, strainers and screens should be at least 50-mesh, and agitation should be provided in the tank. Jet agitation can be supplied quite easily by attaching a second by-pass in the line leading from the pump and running this back into the tank with enough jet orifices in the tank to agitate the contents thoroughly while the pump is running.

(*Turn to Page 155*)



Karmex W applied on Cape Cod farm cleared weeds around cold frame and greenhouse.



Pre-emergence weed control in cotton where Karmex DL was tried in a 1953 test.



Fall treatment of farm land with Karmex W gave good control of quackgrass for two years.



Karmex W applied in March '53 (right foreground) gave better elimination of canary grass than the same treatments applied in December, 1952 (left foreground)



Two years after early spring treatment, Karmex W shows good control of quackgrass in an irrigation head ditch, as compared with untreated background.



Karmex applied at 2.4 pounds per acre to asparagus plot in background. Untreated check is in foreground.



On The

WHEN DDT, the first of the new synthetic insecticides, was made available to the public in 1945, it was used extensively and with phenomenal success for controlling the house fly. Most southern farmers will recall that by 1948 it was failing against this fly in many areas because the insect had acquired immunity or resistance to the insecticide.

Entomologists were disappointed and alarmed that a powerful insecticide such as DDT no longer controlled one of our most important insects. This was not the first case, however, in which an insect has developed insecticide-immune strains. Years before, the codling moth, thrips, and the California red scale had become resistant to arsenicals, tartar emetic, and hydrogen cyanide gas, respectively.

The real surprise in the case of the house fly was the short time required and the degree of resistance that developed. By 1950, DDT was of little or no value for house fly control in most places in the United States. More than 1000 times as much DDT was required to kill the most resistant flies as when DDT was first used.

How did this resistance come about? This is a case of survival of the fittest and natural selection. DDT was used so extensively by 1946 that almost every fly was exposed to DDT. A few of them were somewhat immune to DDT and survived. These survivors, perhaps only a few out of many thousands, reproduced and their off-spring were on the average a little tougher to kill than the previous generation. After 15 to 20 generations, the resistance was so high, DDT treatments were failing to give satisfactory fly control.

The story of the DDT resistant fly has been told many times. But it is worth repeating because by knowing what happened with the house fly it is easier to understand the present, and anticipate the future problem in regard to resistance among other insects.

The house fly was just the first of the insects to become immune to the new insecticides. Let's see what has happened to some of the others. By 1949, in Florida and in California, several kinds of mosquitoes had developed resistance to DDT. The body louse, which threatened United Nations troops in Korea with typhus, was found to be resistant to DDT by 1951. In 1952, chlordane-resistant cockroaches were present throughout the country. Also by that year, or perhaps even earlier, DDT was failing to control the bedbug.

You will recognize that all of these are pests of man or animals. During this period the new insecticides were still doing as well as ever against insects attacking crops. There was one exception — the red spider on greenhouse plants had developed resistance to phosphate insecticides in less than two years.

What is the current status among pests attacking crops and livestock—pests that determine the extent of profits and losses? Here is the report for the 1953 crop season based on investigations conducted by state, federal and industrial entomologists throughout the nation. The grape leafhopper, the apple leafhopper, the cabbage looper, the imported cabbage worm, the potato beetle, the lygus bug on alfalfa, and the potato flea beetle have become resistant to DDT in some areas. Strains of the potato aphid and green peach aphid resistant to DDT and parathion have appeared on fruits and vegetables. Spider mites resistant to phosphate insecticides and some of the substitute insecticides have been encountered in orchards. Laboratory tests have demonstrated that one of the red spider mites common on cotton can become highly resistant to parathion. Cotton leaf worms were encountered in Texas last year that were much more difficult to kill with toxaphene than in 1946. The cotton aphid, a serious pest of cotton, was difficult to control with benzene hexachloride in many areas during 1953. Weather conditions may have caused the trouble but there is suspicion among entomologists that resistance was a contributing factor. Among livestock pests, the Oklahoma Experiment Station has reported the occurrence of toxaphene-resistant ticks. We know, too, that ticks in other parts of the world have developed resistance to benzene hexachloride and toxaphene.

Insect Resistance to Continue

WHEN we consider the hundreds of important agricultural pests that are still effectively controlled with recommended insecticides and compare this list with those that have shown resistance, there is no cause for growers to become panicky. By and large, there is every reason to expect continued good results with insecticides recommended for 1954. If resistant strains are encountered, there is a good chance that an effective substitute can be used because entomologists have not been satisfied to develop only one material to control the more important pests.

I do not wish to infer that the resistance problem is not a serious

*Based on a discussion of the subject at the Cotton Insect Control Conference, Memphis, Tenn., December, 1953. Appearing here through the courtesy of the publishers of *Progressive Farmer* for whom this manuscript was originally prepared.

Insecticide Resistance Problem

one. We do not know how many insects might become resistant, or how widespread the problem will become during the next few years. When resistant insects are encountered in an important species, the insecticide manufacturer, distributor, and grower can lose heavily, for there is a tremendous investment in the development, manufacture, distribution, and purchase of an insecticide for controlling a major pest. If a major pest on cotton, for example, should become resistant and it becomes necessary to substitute another insecticide during the growing season, there might be an over-supply of one item and a critical shortage of another. Of even greater consequence, serious damage to crops might occur before a substitute could be applied.

It is not possible to tell just what will happen in the future, because there is too much we do not know or understand about the resistance problem. The outlook is both good and bad. We now have good evidence that some insects are extremely slow to become highly resistant to certain insecticides. Most malaria carrying mosquitoes, for example, are still effectively controlled in spite of extensive use of DDT for as long as 10 years. In spite of extensive use, there is no evidence that the horn fly on cattle has developed resistance to DDT or the other new insecticides.

On the dark side, we do know, as previously indicated, that among insects affecting man, a high percentage have become resistant to the new chlorinated hydrocarbon insecticides. Does this mean that a high percentage of agricultural pests will also eventually become resistant to the insecticides now used for their control?

Personally, I fear that the list of insecticide-resistant crop pests will grow substantially in the next few years. Several factors may be responsible for the relatively low percentage of agricultural pests that are now resistant. The new insecticides have been used on crops for a shorter period of time. Only a small portion of a crop may be treated, or the insect attacking a crop may also live on wild host plants. In either case, there remains a reservoir of the insect not exposed to the insecticide treatment. These interbreed with survivors from the treated crops, reducing the effect of selection for resistance. A variety of insecticides are used on crops like cotton. Many of the agricultural pests have only one to a few generations each year. Any one, or a combination of the factors mentioned, might prevent or delay the development of resistant strains.

It will pay the grower to watch for resistance, but if partial failure occurs it may be due to other causes, such as mistakes in calculating dosage rates, faulty equipment, and adverse weather — to mention a few.

Entomologists are keeping closer watch on the resistance problems. When difficulties are encountered in controlling a pest which can not be explained by poor application, adverse weather or other causes, they will conduct the tests necessary to demonstrate if resistance is the cause. Growers or custom spray operators who encounter difficulties in controlling a pest formerly controlled effectively, should consult their county agents or extension entomologists for advice.

Every effort is now being made to determine in advance if an insect has the ability to become immune to an insecticide. This can be determined in the laboratory with some insects. The insecticide is applied so that from 90-99 per cent are killed. The next generation is produced by the survivors, and it is treated in a similar manner. This procedure is repeated for 15 to 20 generations. If the insect has the ability to develop a high degree of resistance it is usually apparent by that time. Unfortunately, methods have not yet been developed for rearing many of the important insects in the laboratory.

Other research workers are trying to learn more about the physiological processes in resistant and non-resistant strains. If we had more basic information on resistance, it might help us select chemicals that would overcome or avoid resistance.

Selection of the proper kind of insecticide now seems to offer the best solution to the resistance problem. Research men with state, federal, and industrial institutions are doing all they can to get more information on this point. They have already found through laboratory tests that house flies are slow to develop resistance to pyrethrum and some phosphate insecticides, whereas this insect quickly becomes resistant to all of the currently available chlorinated hydrocarbon insecticides such as DDT, lindane, chlordane, dieldrin, and others. On the basis of such findings, more emphasis is being placed on the development of phosphate insecticides for controlling not only house flies but agricultural pests as well.

Results of such studies, which are still all too meager, indicate that the seriousness of the resistance prob-

(Turn to Page 155)

"Chemafety"

By Leo R. Gardner

California Spray Chemical Co.
Richmond, Calif.

"CHEMAFETY" is new. "Chemafety" can expand the chemical industry; it can create good public relations; and it can make it possible for agriculture to continue use, without paralyzing restriction, of the potent chemical tools with which it has been provided by American industry. "Chemafety" is only new in one sense, in that it is a new word coined to express chemical safety. Safety in the use and handling of chemicals is something we have all considered and worked on over a period of many years. The problems in shipping packages or carloads of chemicals from one large chemical manufacturer to another are relatively simple compared to the problems of shipping equally large quantities of chemicals from large chemical manufacturing plants to agricultural users.

The agricultural chemical industry has done an outstanding job in providing safe packaging of materials, precautionary labeling on products, appropriate antidotes and first aid treatment, together with a good program of education in safety to the user. The results of this effort speak for themselves in the record of safety that has been accomplished in the use of tremendous annual tonnages of chemicals, some of which are highly poisonous.

There are certain new things that might be done by the industry to expand chemafety on the farm. With the newer chemicals, there appears to be a need for more accessible information on first aid and



follow-up treatment for accidents resulting from exposure to some of the newer chemicals. To meet this need, it is thought that some one central laboratory approved by American Medical Association might be supported to furnish first aid treatment and follow-up treatment advice to the medical profession throughout the United States on a 24-hour per day service every day in the year. By such a facility every doctor and every hospital would know exactly where to call for the best advice in the treatment of accidental exposure to any of the new chemicals that are being marketed. It is difficult to estimate the value that would come from such a service, but it would certainly save many lives every year, and also speed up the recovery of patients exposed to chemicals. Because of the vast number of new materials being placed in marketing channels, it is almost impossible to expect that the medical profession can be fully informed instantaneously on the treatment of each and every poison, whether used singly or in combination.

As another tool for improving safety on the farm, it is thought that the agricultural chemical industry might adopt a national policy of carrying one sentence in every advertisement reading somewhat as follows: "All chemicals are capable of doing harm if misused or mishandled. Always read labels and note cautions before use." The mass effect of such a program should cer-

(*Turn to Page 153*)

SAFETY PROGRAMS for the Agricultural Chemicals Industry



Two pages of the Monsanto Chemical Co. booklet, "Look Out For Yourself" (cover reproduced below) are illustrated at right. The 12 page booklet includes safety sketches which describe first aid treatment and equipment.

EMPHASIS on the hazards of handling and applying insecticides and fertilizers, suggested precautions and safety measures are being stressed in active safety programs by industrial concerns, government groups and the National Safety Council. Education of users and all personnel involved in the manufacture and handling of agricultural chemicals is in full progress.

Among the activities in these programs are a series of posters created especially for the fertilizer industry illustrating forceful messages of precaution, and offered by the National Safety Council. Other activities of the Council include safety contests and the distribution of literature on safety measures.

A recent letter from the National Safety Council, Chicago, points out that "the fertilizer industry as such has had a very bad accident frequency rate in the past," and the movement to establish a fertilizer safety section resulted from the necessity of improving this record. (The Fertilizer Section was established in January, 1953.) Interest in accident prevention throughout the fertilizer industry has reached a high point and "Safety" has become a byword in the majority of fertilizer operations.

Through the efforts of the National Safety Council, the North Carolina Labor Department has initiated a concentrated two-year safety program in the state. The Council reports that plans are now underway by the fertilizer safety section to get such drives started in Georgia, Virginia and several other states. The fertilizer section also has a speakers' bureau which provides speakers on safety for various groups in the fertilizer industry throughout the nation.

VARIOUS industrial concerns are active in the National Safety Council programs, and continue safety education programs of their own. Among the recent literature issued, are two booklets distributed by Monsanto Chemical Co., St. Louis. One

(*Turn to Page 153*)



Top left: One of the National Safety Council fertilizer industry posters; top right: typical safety booklet issued by state farm bureau; bottom left and right: Safety booklets for air and ground crop sprayers, issued by Monsanto Chemical Co., St. Louis.



California's Fertilizer Industry

PART III

By Sidney H. Bierly
Secretary
California Fertilizer Association

LAST month, we reviewed fertilizer mixing plants within the membership of the California Fertilizer Association situated in the San Joaquin and Sacramento Valleys of California. This month our report covers the mixing industry in the Salinas Valley and the southern San Francisco Bay area.

The new plant of John Taylor Fertilizers, is located in North Sacramento. The firm was organized in January, 1951. The plant was constructed of building tile, with an area of 10,000 square feet, on the Southern Pacific Railway. A new 1-ton Ransome dry mixer is fed with material from bulk storage bins. Cars are unloaded with a specially constructed scoop on a fork-lift truck, and a portable belt conveyor loads the bins. An overhead conveyor system will soon be installed. Two Vredenberg valve packers complete the mixing and bagging equipment. To service the farmers in the immediate Sacramento area, 10 Ezee Flo spreaders, a number of broadcasters, several injectors and other equipment is maintained by the company. Sales in other areas, including Yolo, Solano, Yuba and outlying portions of Sacramento Counties are handled through dealers. In addition to fertilizers, complete lines of insecticides and herbicides are sold.

H. Walton and Dirck Arrowsmith, a father and son team, operate the Western Farm Chemical Co., which serves the Sacramento Valley. The concern was organized as a partnership in 1948, in a leased warehouse in Walnut Grove, by W. R. Allstetter and W. E. Jaqua, operating a small rotary dry mixer. On January 1, 1950, H. W. Arrowsmith, who had been with American Cyanamid Co. for 24 years, joined the firm and located a distribution warehouse in Woodland in June, 1951. On June 11, 1952, Arrowsmith purchased the interests of Jaqua and Allstetter and discontinued the Walnut Grove operation. At that time, a small but modern mixing plant was installed in Woodland. This includes a half-ton mixer, bucket elevator, vibrating screen, hammer mill, valve pack bagger, bulk storage bins and bulk unloading equipment. Dirck joined his father in June, 1952 in the company management.

Sutter Orchard Supply, Yuba City, was founded in 1933 by Orin Daniel as a one-stop farm supply

house, serving farmers of Sutter, Yuba, Butte, Sacramento, Colusa and Glenn Counties. This area is a rich center of production of canning cling peaches, citrus, olives, almonds, walnuts, prunes, pears, apricots and cereal, pasture and row crops. Fertilizers assumed growing importance and in March, 1951 a one ton dry mixing plant was installed. "S.O.S." brand mixed fertilizers are well known throughout the area. Simple fertilizers, a complete line of pesticides and other crop production aids are also handled by Daniel.

The Triangle Co. of Central California is located in Salinas, which is the center of a rich fresh vegetable and sugar beet producing area. The original concern was organized in 1928 by William E. Simas, who is president of the existing corporation and a director of the California Fertilizer Association. The name, Triangle Co., exemplifies the equal interests of employer, employee and consumer, and this name has become well known throughout the area served, as the company brand. Simas designed and built the 20,000 ton capacity dry mixing plant and later a plant for ammoniating superphosphate. On January 1, 1953, the company was incorporated. Other officers are Virgil A. Frizzell, vice president and general manager, and Earle E. Kaplansky, treasurer. In addition to the complete line of mixed and simple fertilizers, they formulate and sell "Triangle" brand insecticides. The company provides a complete fertilizer and insecticide applicating survice in the Salinas Valley. A new application service depot and warehouse has been established at Oxalis on the west side of the San Joaquin Valley which provides service to that area. Triangle was also an early supplier of liquid fertilizing materials in the Salinas area. Its products are sold in Monterey, Santa Cruz, and Santa Clara Counties, and in portions of the San Joaquin Valley.

J. F. Sloan Co., located in the railroad yards, Salinas, was founded in 1946 by James F. Sloan as a retail outlet. In 1948 Mordy S. Rose came



Western Farm Chemical Co., Woodland, California.



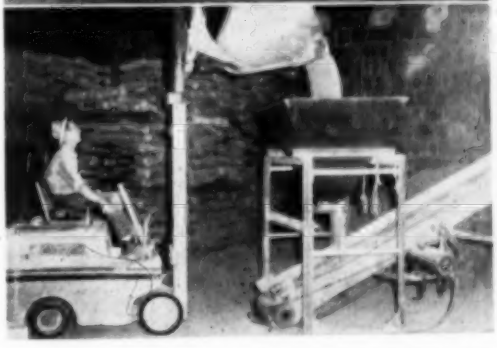
A. L. Castle Inc., Mountain View; left to right: A. Cornejo, W. Burr, manager of the fertilizer department and W. Langard



A. L. Castle Co., Inc., Mountain View, Calif.



Sutter Orchard Supply, Yuba City, California.



John Taylor Fertilizers, Sacramento, California.



Above, left to right: D. W. Watts, co-owner of Garden Valley Fertilizer Co., Campbell; J. McGinley, manager of Naco Fertilizer Co., Santa Clara; J. Taylor, owner, John Taylor Fertilizers, Sacramento; and Orin Daniel, owner, Sutter Orchard Supply Co., Yuba City.

in as a partner and a 15,000 ton Stedmann dry mixing plant was installed. A complete line of "Salad Bowl" brand mixed fertilizers is sold to farmers and dealers in Monterey, Santa Cruz and San Benito Counties. The firm formulates and sells "Salad Bowl" brand insecticides as well. A complete application serice is provided for both fertilizers and insecticides. The plant is served by both rail and truck.

Associated Chemicals, owned and operated by William B. Dickens, Sr., is located on the Salinas-Castroville Highway north of Salinas. The plant is equipped with a Stedmann dry mixing plant, capacity 40 tons per day. Their specialty is complete mixtures for vegetable crops and lawns and gardens of the surrounding area. A complete application service is provided. Lines of pesticides and agricultural minerals are distributed.

The Boyer Fertilizer Service, Watsonville, was established in 1925 by H. F. Boyer who is still actively in charge. The concern mixes and distributes dry fertilizers under the "Du-Gro" brand. The plant features a 10,000 ton custom built Link-Belt mixer. A complete pesticide line is also distributed and applied.

The K. W. Macdonald Co., was organized by Mr. Macdonald in 1930. He installed industry improvements as they developed, keeping his plant up-to-date, and was one of the first to provide an application service in the Salinas and Pajaro Valleys. The present management is under the direction of Earle E. Kaplansky, managing partner. His associates in ownership are William E. Simas and Virgil A. Frizzell. Materials sold are mixed and simple fertilizers and agricultural minerals, and the area served includes the counties of Santa Cruz, San Benito, Santa Clara and Monterey.

The Garden Valley Fertilizer Co., Santa Clara County, was established in 1946 by Don Watts; in 1948 Arthur Ferrari became a full partner. A liquid mixing operation utilizes a 2000-gallon tank equipped with an agitator. Mixed fertilizers and simples in the form of nitrogen solutions and liquid phosphoric acid are distributed in the south and east San Francisco Bay agricultural areas. A branch warehouse at Tracy serves San Joaquin County. Complete lines of insecticides and agricultural minerals, including sulfuric acid for direct application to the soil, are handled.

The northern California Fertilizer Co., San Jose, was established in 1939 by a corporate group, including Y. Bepp, current general manager. A complete line of dry mixed fertilizers has been formulated and sold under the "Shasta" brand in the Bay area and in Sacramento and San Joaquin Counties. The mixing plant is a new custom built unit of 40 tons per day capacity, having been installed last winter. The plant is served by both rail and truck. A complete line of insecticides is handled.

In the industrial area of Santa Clara, which adjoins San Jose on the

(*Turn to Page 155*)



Above: Dirck Arrowsmith, Western Farm Chemical Co., Woodland, contacting field with 2-way radio. Center: J. F. Sloan, president, and M. S. Rose, vice-president of J. F. Sloan Co., Salinas; extreme right, applicating equipment at J. F. Sloan Co.





N. F. A. Readies Program for 29th Annual Meeting

DISCUSSIONS of granulation processes, fertilizer manufacture, sales, application, etc. are on the agenda for the 29th annual convention of the National Fertilizer Association to be held June 14-16 at the Greenbrier Hotel, White Sulphur Springs, West Virginia.

"Agriculture Moves Toward Useful Abundance," is the subject of the opening address on Monday, June 14, by Ezra Taft Benson, U. S. Secretary of Agriculture. Features of the Tuesday program are addresses by Louis Ware, NFA board chairman and president, International Minerals & Chemical Corp., and the Hon. W. Sterling Cole, Congressman from New York and chairman of the Congressional Joint Committee on Atomic Energy. Congressman Cole will speak on "Putting the Atom to Work in Industry and Agriculture."

Two symposia, sponsored by NFA's Plant Research Committee, are scheduled for Wednesday morning, June 16, and will run concurrently beginning at 10:00 a.m. Of particular interest to engineering and plant operation personnel will be a discussion of the granulation process in the production of fertilizer. The other symposium, of special interest to management and sales personnel, will consider factors influencing the movement of fertilizer. Audience participation is invited in both symposia.

Appearing on the panel which will consider the question—"What Makes Fertilizer Move?"—are Harold R. Dinges, Spencer Chemical Co.; George E. Smith, University of Missouri, and O. E. Anderson, Ohio Bankers Association. H. H. Tucker, Coke Oven Ammonia Research Bureau, will moderate the discussion.

Panel members who will discuss the granulation process are W. W. Coffin, Link-Belt Co.; Robert J. Engelhardt, John J. Harte Co.; John O. Hardesty, Agricultural Research Service, U. S. Department of Agriculture, and L. D. Yates, Tennessee Valley Authority. Moderator of this discussion will be Edwin C. Kapusta, NFA's chemical engineer.

A business meeting will follow Mr. Cole's address on Tuesday morning. Meetings of the executive committee on Sunday evening, June 13, and of the board of directors Monday morning, June 14, will precede the official convention opening. Meetings also are scheduled of NFA's plant food research, public relations, and publications committees.

A refreshment hour through the courtesy of International Minerals & Chemical Corp. will precede the convention dinner scheduled for Tuesday evening. Monday evening feature is a cabaret party. This will be preceded by cocktail parties given by American Potash & Chemical Corp. and H. J. Baker & Bro., and a reception by Southern Potash Corp. Special events for the ladies include a garden party Monday afternoon, and a bridge and canasta party Tuesday afternoon. Golf and tennis tourneys are planned for both men and ladies along with a horseshoe pitching contest for men.

Attendance at this year's convention is expected to total around 700 including personnel of NFA member companies and their wives, guests of the Association, and press representatives.

Sunday, June 13

7:30 P.M.—Meeting of the Executive Committee

8:30 P.M.—Registration Begins

Monday, June 14

8:00 A.M.—Breakfast Meeting—Committee on Publications

9:00 A.M.—Registration Continued

9:00 A.M.—Meeting of the Board of Directors

11:00 A.M.—GENERAL MEETING — Louis Ware, President, International Minerals & Chemical Corporation, and Chairman of the Board, The National Fertilizer Association, presiding

Invocation: Rev. D. L. Beard, Pastor, First Presbyterian Church, White Sulphur Springs, West Virginia

Address: "Agriculture Moves Toward Useful Abundance," Honorable Ezra Taft Benson, Secretary of Agriculture

(*Turn to Page* 136)



H. H. TUCKER
Coke Oven Ammonia Research Bureau
Moderator of Fertilizer Panel

E. C. KAPUSTA
National Fertilizer Association
Moderator of Panel on Granulation Process



ENTOMOLOGY...

reaches its 100th birthday

AS a group, entomologists are unimpressed by heroics. All this fuss about their profession being 100 years old, has some of them pink around the ears. Yet, they have contributed mightily, not only to the advancement of science, but to the progress of mankind. What's more their job is getting even bigger!

Scientists, working on the blueprint of tomorrow's agriculture, are specifying further improvement in insect control. They can't translate the nek gains of their test plot production into farm practice without it. Two hundred bushel per acre corn and 10,000 pound per cow milk production depend on a lot of things. But if you can't control insects they say, you might as well forget it. The problem of farm surplus, while it worries us today, is only a flash in the pan in the cons of time. And by comparison, we are far enough along with our world census to know that production, not surpluses is our real long range problem. Food production, divided by the capacity of the world's human stomach doesn't go around, even now.

And, apart from volume of food production, is the cost of the production. When results show that pea growers can make a six for one return, for every dollar spent on insect control - that means lower cost per unit. When insecticides save Nebraska farmers 2 million dollars worth of grasshopper damage—it's easy to conclude that, wisely used, insecticides are one of the biggest profit makers and money savers a farmer can use.

This interest in insecticides is further fed by a world-wide recognition of the spectacular success resulting from the control of disease-carring insects such as the malaria mosquito. The millions of humans who are alive today and the tens of millions yet unborn, who will live because of insect control, are causing revolutionary changes in the blueprints of the world's strategic planners. This new 20th century power to let live may in time far over-shadow the harnessing of the energy of the universe to kill.

Has any generation ever lived in a more exciting and challenging period? Since the entomologist is one of the key figures in these new blueprints, the question arises—what is he—where is he?—How many entomologists are there—where are they employed?

According to the chairman of the public information committee of the Entomological Society of America, David G. Hall, there are an estimated 4,500 entomologists in the U. S. Or, turn the figure around a bit and you can say there is one entomologist for every 33,000 Americans! That means one person in a city the size of Lebanon, Pennsylvania or Elkhart, Indiana.

Since an entomologist looks like anyone else, it would take detective work comparable to that of the vaunted "Dragnet" to find him. Fortunately, it is the entomologist who is the hunter not the hunted, so it's possible to make rather reliable estimates of where entomologists are.

Let's begin with the government. In the USDA there are 435 entomologists. This is out of a total of 55,032 full time employees including secretarial and other service personnel. Here the entomologist is "among friends", for one person in 126 is a member of the profession.

While there is a wide range of entomological work in the USDA, it all comes under general headings such as production and protection of crops, livestock, poultry, and woodland. There is also some work on insects affecting man. Work is conducted on a national and sometimes international scale.

Work of a similar nature is carried on in agricultural colleges and



Interior view of early insecticide plant. Vintage of 1900.

By Donald Lerch

Cornwell Inc., Washington, D. C.



William C. Piver in his "laboratory," where he worked out his method of making calcium arsenate.

experiment stations throughout the nation. Here about 475 entomologists are employed, including 66 extension entomologists. We'll have a bit more to say about extension entomology later in this article, because its significance is often overlooked.

The U. S. Public Health Service employs about 80 entomologists. These scientists are at work on methods for controlling insects which spread communicable diseases. Many notable advances have been made by men who have dedicated their lives to this branch of government service.

Modern warfare draws heavily on entomologists for the protection of men and material. About 100 entomologists serve in the armed forces. Some are reported at work on the complex problems of biological warfare.

Perhaps someday the world will know what prompted the Russians to torture captured American flyers into confessing their guilt for spreading disease germs. Why was so much stress put on forcing American confessions? Remember too, it was in Korea that resistant body lice were found. What is the significance of intense Russian interest in this alleged weapon of war? These and other related questions have yet to be answered.

About 1,000 entomologists are employed by industry, including pesticide companies and other businesses where the problem of insect control is of major concern, such as food processors. The work is varied, ranging from screening chemicals for insect killing power, to helping develop labels to facilitate effective and safe use of insecticides. Entomologists and the pesticide industry are integrated,—each contributing to the other, of which it is a part.

The remaining entomologists, about 1,400 in all, are engaged in quarantine or control agencies of the federal government, teaching, state regulatory bodies, and private consulting services.

Now, looking at these statistics as people instead of figures, there is a very promising and gratifying generalization which can be made. Entomology today is manned by young men. Compared with many other professions, the entomologist is a youngster.

Primary reason for this is the tremendous growth of the profession during the war, and because of the mammoth development of the pesticide industry immediately following. The profession was growing even before the war, however.

It is reliably estimated that the number of entomologists has doubled during the last 15 years. Most of the new men have gone into industry and phases of the work other than service with the federal government. In fact, the strength of entomology on the federal level has deteriorated. Dollars have depreciated faster than appropriations have increased.

Nationally, however, entomology is growing and more and more opportunities for skilled men are developing. The profession is a healthy one.

ONE of the seldom mentioned contributions of entomology is its role in the establishment of the Department of Agriculture itself. Because the pages of history sometimes stick together and important persons and places are missed, it should not be claimed that entomology itself was responsible for the creation of a government department. On the other hand, it can be stated conservatively, that entomology was a charter member.

Before the Department of Agriculture came of age—when it was a mere Bureau in the U. S. Patent Office, an insect specialist was there working. He was Townend Glover (1813-1883) a woolen goods clerk, artist, land proprietor, pomologist, and insect specialist. On June 14, 1854 he began working for the new Bureau of Agriculture in Washington collecting "information on seeds, fruits, and insects in the United States."

Whether he became discouraged or was enticed by a better offer is uncertain. In any event, he resigned after five years and took a position with the nearby University of Maryland, where he became a Professor of Natural Science.

At this time there was a growing realization that more minds must be brought to bear on the all important problem of raising more food to power the growth and development of this nation. The decision to establish a Department of Agriculture soon followed, and became law upon signature by Abraham Lincoln.

The increased emphasis on the scientific approach to agriculture which resulted, made it possible to increase food production sufficiently to release more people for industrial production. And enough food was left over to feed the waves of immigrants who came to our shores seeking a better life.

(*Turn to Page* 149)



100 Years of Insect Control With Chemicals

By H. H. Shepard
USDA, Commodity Stabilization Service
Washington, D. C.

ONE hundred years ago when Asa Fitch and Townend Glover received their appointments as entomologists in the service of the public, chemicals that could be relied upon for the large-scale control of insects were virtually unknown. Soaps, sulfur, tobacco in the form of dust, water extract or smoke, and a few other materials could be recommended to control plant-lice and other easily-killed pests in gardens and on house plants. Glover reported that a whale-oil soap solution had been applied against aphids in a garden or greenhouse with much advantage, but he emphasized that "upon the extended scale of a cotton plantation, such a remedy is altogether too trifling and impracticable".

Widespread crop losses to the Colorado potato beetle, which became a potato pest just prior to 1860, led to the discovery of paris green as a reasonably safe insecticide from the standpoint of its application to crops, such as potatoes, apples, and cotton, for the control of the potato beetle, cankerworms, the codling moth, and the cotton leafworm. By 1887 paris green was the standard remedy for leaf-and fruit-consuming insects. By 1900 production of paris green in the United States was about 4,000,000 pounds annually.

Lead arsenate, developed soon after 1890, was not available commercially until about 1903. By 1918 it had replaced paris green for many purposes and production had reached 30,000,000 pounds annually.

The first commercial batch of calcium arsenate was shipped in 1812 for cotton leafworm control. Because of the rapid spread of the boll weevil and the heavy damage to cotton by that insect, calcium arsenate sales increased to about 3,000,000 pounds for dusting that crop in 1919. By 1922 nearly 16,000,000 pounds were sold for the same purpose.

Not until five years after the appointment of the first official entomologists was the earliest well drilled for the purpose of obtaining petroleum. Previously, mineral oil supplies had come principally from oil-bearing shales. Kerosene emulsion was developed for popular use about 1880 and for the next decade or two entomologists considered it almost an ideal contact insecticide. Kerosene emulsion was nearly always home-made. Serious scale-insect infestations of citrus orchards in southern California led to the extensive use of petroleum oils on these trees. When, as at first, not emulsified, the oils were soon found to be injurious to the trees. About 1905, "Scalecide", a proprietary miscible oil, appeared on the market in the East where it competed with home-made lime-sulfur solution for application to orchard trees in control of the San Jose scale. Proprietary oil-emulsion pastes also were soon available, their advantages being the constant supplies of the same grades of oil and the more efficient means of manufacture when produced commercially.

Of the botanical products, only tobacco was widely known in 1854 to be of value as an insecticide. Powdered pyrethrum flowers apparently were not introduced into the United States until four years later. Pyrethrum powder was expensive and applied chiefly as a household remedy. It became cheaper after pyrethrum culture began in California about 1880. The area devoted to this crop expanded to as much as 2,000 acres, but competition of Japanese pyrethrum made its culture unprofitable in the United States soon after 1900. Rotenone insecticides were not of consequence until about 1933.

In the period from 1910 to 1930 Federal and State laboratories screened many synthetic organic compounds in a search for better insecticides. Noninflammable fumigants, stomach poisons not so dangerous as arsenicals, and synthetic compounds competitive with nicotine and pyrethrum were sought. Examples of insecticides developed by these programs were ethylene dichloride and phenothiazine.

The ingenuity of organic chemists in industrial laboratories has in recent years provided an ever-increasing flow of compounds to be screened for insecticidal activity. Keen competition between chemical manufacturers has resulted in a large number of new insecticides possessing a high degree of effectiveness against many pests. Commercially, a parade of newcomers began with DDT a little more than ten years ago. Following DDT came benzene hexachloride, chlordane, toxaphene, aldrin, dieldrin, heptachlor, endrin,—all with a high content of combined chlorine. The introduction of DDT into the United States in 1942 and its eventual release for civilian use in 1945 might be considered the most revolutionary development in the chemical control of insects in the entire century. Except for oil emulsions, most main types of insecticide now employed stem from practices though minor ones, over a hundred years old. Arsenic was known to be an insecticide before paris green was first applied to potatoes; that plants may have insecticidal properties was no new principle; and Glover himself experimented with an organic fumigant (chloroform).

Recent developments tending to revolutionize the chemical control of insects are, 1. The prolonged residual protection afforded by dried deposits of chemicals, such as DDT, so that insects are killed merely by contact of the feet or portions of the body with the insecticide. 2. The extreme dilution of such chemicals that is possible, so that broadcasting them over forests and selected field crops provides effective insect control where previously virtually no control was economical. 3. The treatment of enormous acreages of infested soil with such chemicals as aldrin, and the fumigation of thousands of acres with ethylene dibromide and "D-D Mixture," for wireworms and nematode control. 4. The formulation of dusts and spray concentrates ready for use, often designed for specific crops and localities.

The recent discovery of organic phosphates having a high degree of insecticidal activity may eventually prove as momentous as that of DDT and similar chlorinated hydrocarbons. Tetraethyl pyrophosphate (TEPP),

parathion and malathion are three such insecticides now established commercially. The potential value of this class of compounds appears to lie considerably in the systemic action characteristic of such organic phosphates" as schradan and "Systox", whereby the insecticide is absorbed through roots or foliage and kills by way of the plant sap.

Following the repeated application of particular insecticides over large areas, some insect species become more difficult to control with those chemicals. This was observed as early as 1916 when scale insects on citrus trees in California were shown to be acquiring resistance to cyanide fumigation. Other cases include the arsenical resistance of the codling moth. With the extensive use of persistent deposits of DDT and similar insecticides, resistance poses an increasingly serious and widespread problem.

Insect control has become so much more efficient ever since World War II that in 1953 domestic consumption of only the 14 major insecticidal chemicals—those whose use amounted to at least 1,000,000 pounds—totaled about 186,000,000 pounds of which less than 20 percent was for materials known prior to the advent of DDT. Ground sulfur is excluded from this calculation. No allowance has been made for the fact that the newer insecticides go several times as far as, for instance, the arsenicals.★★



Entomology... the Science and the Profession

By H. H. Ross

Illinois Natural History Survey
President of ESA

MAN has always had his troubles with insects. When he first emerged as man he already had fleas and lice and was fed on by mosquitoes and pestered by flies. At this period it is doubtful if insects and insect-borne diseases were nearly as important deterrents to man as were other inimical factors of the environment. In fact, on the average, insects were probably of great help, because termites, grasshoppers, grubs, and the like could be found when other foods were not obtainable.

From primeval conditions man's progress has been based essentially on changing various factors of his environment and making it better suited for his own survival and increase. But every change that benefited man also benefited a host of insects. Gradually, as the more stark enemies of primeval life, such as the leopard and tiger, ceased to be a threat to man, insects became increasingly important as a challenge to his success.

In order to cope with these insect problems it has been necessary for us to find out a great deal about the insects themselves. Entomology, the study of insects, started out as a small branch of natural history. This indeed it was two centuries ago when only 2000 different kinds of insects were recognized in the whole world. But today, when the world census of known insect species stands at 700,000 and we are certain it will reach at least 2,000,000, and in North America alone we have over 6000 species of insects important enough to be called public enemies, entomology is one of the largest of the natural sciences.

The number of detailed facts about insects that are known already is fantastic, and every year some 6000 published articles add to this store of knowledge. What are some of these facts? They cover a diversity of the answers we need to have about insects—how to distinguish one kind from another, the number of generations produced annually by each kind, the effect of a cold winter or dry summer on each, and many others. We have found that certain insects feed only on one plant, other insects may feed on hundreds. Some insects eat stored products, others attack growing crops, or livestock, or man. Some insects are in themselves only irritating but transmit disease organisms of plants, livestock or man which makes the insect vector of paramount importance. There are insects on the other side of the ledger—those beneficial types which pollinate all our legume, cucurbit, decidous fruit, and many other crops, and those which prey on other insects.

The science of entomology has the task of augmenting, organizing and coordinating this huge mass of factual material so that it may be utilized in reducing the inroads that insects make in our economy and health. To accomplish this requires a highly trained corps of entomologists, each with a special job to do.

Supplying the great bulk of our basic information are groups of workers in different aspects of entomology: taxonomists, concerned with the identification of insects; morphologists and physiologists, studying the structure of insects and finding out how they function as living organisms; biologists and ecologists, finding out life history data, and the effect of various factors of the environment on different insects; toxicologists, studying the effects of various insecticides on insects; and many other types of specialists.

From base data supplied by the researches of these groups the applied entomologist works out and tests methods for controlling the pest species of insects. The problem is to find the period or time in the life history of the insect when it is most vulnerable to being destroyed in a practical manner. Against some insects an excellent control method is devised easily and quickly. More often control methods must be improved laboriously over the years to make them more effective or cheaper. The applied entomologist must also fit the insect control into other activities in the field. Mosquito control, for instance, must not interfere with sanitation, or must be combined with effective water storage, depending on local conditions. Against insects on agricultural crops, control methods must be compatible with practical farm management. These facets increase the complexity of the problem.

Once control measures are devised, the information must be put into the hands of the farmer, householder, or public health official, so that they can use it. This is the job of the extension entomologist. He uses every facility at his disposal press, radio, TV, personal talks, and demonstrations—in an effort to disseminate to best advantage information in the fight against the insects.

Training workers in the various phases of science which contribute to or constitute entomology is the job of the teacher. Over 40 of the principal state and privately endowed universities and colleges offer curricula in entomology for advancing the education of the scientists necessary to wage our war with insects.

This is a thumb-nail sketch of the science and profession of entomology, devoted to the control of insects through applied research, to the end that the world will be a more productive and healthy place for man to inhabit.★★



Cereal and Forage Crop Insects

By C. R. Neiswander
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ALTHOUGH entomologists this year are celebrating the hundredth anniversary of the institution of professional entomology, but little real progress in insect control has occurred before the beginning of the 20th century. Even from that time on, progress in the control of cereal crop insects was extremely slow, the measures used consisting essentially of the manipulation of cultural practices. In fact as recently as 10 or 15 years ago it was considered completely impracticable to think of treating a field of corn or a legume meadow with insecticides for insect control.

The introduction and spread of the European corn borer in the midwest area beginning in the early 1920's was considered such a calamity because, in the first place no practical controls appeared promising, in the second place it did not seem possible that an effective insecticidal material could be developed for an insect working inside the corn plant, and in the third place no one had any conception of just how an insecticide could be applied effectively to a 10, 20, or 30 acre field even if satisfactory insecticidal materials were available. No insecticide application equipment had ever been designed for that type of service.

Following the appearance of the first synthetic organic insecticide, a new attitude developed toward insect control investigations. No problem seemed too big. New and highly effective materials appeared at a rapid rate. Along with these new materials a rapid development also began in application equipment so that machinery soon became available for almost any need. As a consequence practical insect control procedures were developed for many insect species the control of which formerly seemed hopeless. Such spectacular results in the way of increased yields were obtained that it soon became evident that insect damage in many instances had been under-estimated.

During the past decade the meadow spittlebug accumulated in such numbers on legume crops throughout much of the midwest area that farmers were complaining that they were no longer getting satisfactory hay yields. When it was found that this insect could be readily controlled by a single timely application of an insecticide, hay yields were increased by as much as one-half ton per acre. In Ohio in 1952 approximately 300,000 acres of clover and alfalfa were treated for spittlebug control at an average cost of about $2.50 per acre. Assuming that the average value of legume hay in 1952 was $20 per ton, the total value of the insecticide treatment to Ohio farmers over and above the cost of application in that year was $2,250,000.

In past years damage to alfalfa from the potato leafhopper has been accepted as matter of course. Now that it is becoming recognized as practicable to treat field crops with insecticides, farmers are beginning to recognize the importance of leafhopper injury and are starting to treat their crops, again with considerable rewards in crop production. Although the farming public as a whole is not yet conscious of the damage being done and of the possibilities of insect control, rapid strides are being made.

Insects on wheat and corn are still controlled largely by the manipulation of seeding dates and the selection of crop strains resistant to insect injury. It is hoped that these cultural practices will continue to give satisfactory results. However, insecticides and application equipment are available if unusual outbreaks should occur. Extensive acreage of both crops was protected from the armyworm outbreak that occurred in 1953. Although a sudden increase in corn borer popuation would undoubtedly cause severe damage, facilities are available for farmers to protect their corn crops if the need for treatment is recognized in time.

Perhaps the most recent development in insect control procedures in cereal and forage crops is that involved in the control of soil insects. This apparently is another instance in which the extent of damage has not been appreciated. The clover root borer, the corn rootworm, the seed corn maggot as well as the various wireworms, cutworms, and white grubs all take their toll of the various crops on which they feed. These insects can be controlled by direct applications of insecticides to soils, as broadcast or strip treatments. In some states fertilizer dealers are now mixing the soil insecticide with the fertilizers so that the two types of materials can be handled in a single application. Although this involves some difficulty in mixing and labelling, it is a phase of insect control that is likely to increase greatly in popularity inasmuch as recent investigations have shown marked increases in yield following such applications. Intensive investigations are being pursued on the effect of insecticide accumulations in soils on soil micro flora and the resulting subsequent effect on plant growth. Information obtained to date suggests continued expansion in this field of insect control.

Up to the present time but little attention has been given to the overall control of pasture insects. It is only occasionally that any one insect species appears in a noticeably destructive outbreak on pasture crops and in those instances the species is given some attention by investigators. However, as Osborn states in his book on meadow and pasture insects, "in

practically every season the *aggregate* loss from the *combined* attacks of the many species of grasshoppers, the various cutworms and armyworms, white grubs, wireworms, leafhoppers, etc., is a very heavy one on the meadow or pasture crop. It becomes especially desirable therefore to know the possibilities of prevention or control of the *composite* or *average annual assemblage*."

The difficulty in the pasture insect control problem stems from the fact that any chemical control must have an extremely low mammalian toxicity if pasturage is not to be restricted. Certainly the problem should be given some attention. Perhaps late fall or early spring applications might be made effectively without producing a residue hazard.

The tremendous expansion in insecticide control procedures and the extraordinary results that have been obtained in an extremely wide range of insect pests, however, should not blind investigators to the value of intensive studies of cultural practices, the selection of strains of crops less susceptible to insect damage and the devising of other possible ways of modifying the environment to lessen insect injury. Control will never be completely satisfactory until the best possible solution has been reached.★★



Developments in Forest Entomology

By W. L. Baker
U.S.D.A. Forest Service
Washington, D. C.

THERE was little or no public interest in the damage being caused to our forests by insects when entomology came of birth a hundred years ago. Simply stated, the reason for this was the presence in this country of an over-abundance of trees. Generally speaking, there was less interest in the protection of our forests from such destructive agents as insects than in how to rid the landscape of an excess of forest cover. At that time the study of forest insects was a matter of academic interest only.

It was something less than a hundred years ago that concrete interest in forest insects first became noticeable. An important early student of these organisms was A. S. Packard. It was in some respects the publication of his "Forest Insects" in 1890, as the 5th report of the U. S. Entomological Commission, that first brought to focus the problems and needs of forest entomology in this country. It was in 1890 also that Dr. A. D. Hopkins began his studies of certain bark beetles, as a joint responsibility of the Division of Entomology and the Forest Service of the U. S. Department of Agriculture. During the following 10 years this work was greatly extended, particularly in the Black Hills National Forest.

Federal recognition of the need for organized investigations of destructive forest insects was exemplified in 1902 by the establishment of the Division of Forest Insect Investigations in the Department of Agriculture. Beginning with a small nucleus of trained entomologists, this Division has grown through the years and now conducts its research and survey activities in laboratories and work centers representative of all forest regions in the country and Alaska. In 1953, it was transferred from the Bureau of Entomology and Plant Quarantine to the Forest Service.

Considerable progress has been made during the past 50 years in locating and identifying the insect species that feed on the trees of this country. Not all of this has been accomplished by Federal entomologists. Entomologists in state organizations and in colleges and universities also have contributed greatly to our knowledge of these organisms. The combined results of these investigations provide a working knowledge of the life histories, habits, and direct control of most of the major pests operating in our forests today. During these years there has been a tremendous increase in public interest in the control of forest insects. Several catastrophic outbreaks of bark beetles and defoliating insects, causing losses of billions of board feet of valuable timber, served to focus the attention of conservation-minded people on the gravity of the situation. Support for research into methods of controlling outbreaks gradually increased during the years. As a result, provisional control methods were developed and more and more generally applied. Forest entomology as a science progressed slowly prior to and including World War II. Since that time developments have come thick and fast, and in some respects have been phenomenal.

The synthesis of DDT during World War II provided the stimulus for increased progress in forest insect control. Prior to the availability of this chemical it was wholly impractical, if not impossible, to control widespread outbreaks of defoliating insects under forest conditions. Now it is commonplace. Applied by airplanes, DDT has protected trees on millions of acres of forests, in mountainous and otherwise inaccessible terrain, from serious defoliation and possible death, at a cost of approximately a dollar an acre.

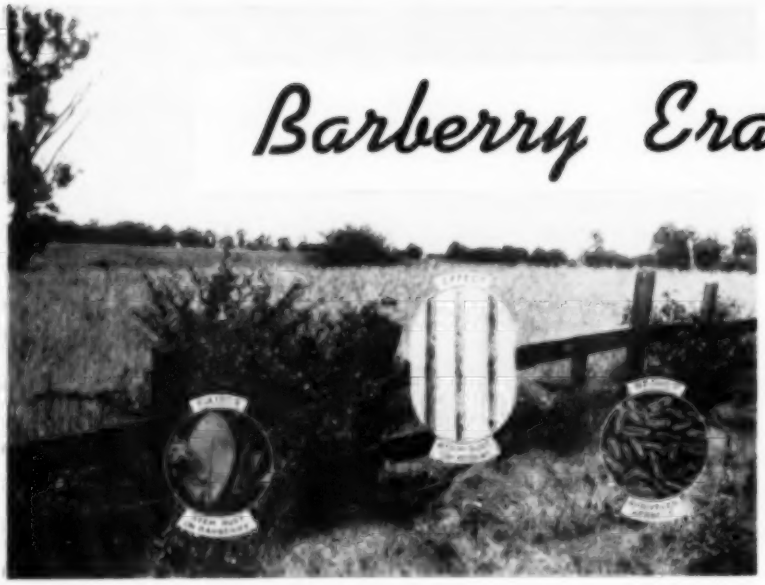
The success against defoliating insects with DDT also stimulated research with related compounds for use against other insects, including bark beetles and borers. Some of these are proving to be more effective and economical than others previously used against these insects. There have been improvements in techniques of direct control. Infestations of certain species of bark beetles can now be controlled by applying sprays to the bark of standing trees with lightweight, ground sprayers. This represents a great saving over older meth-

(*Continued on Page 138*)

The second part of this symposium honoring the Entomology Centennial will appear in the July issue of "Agricultural Chemicals". Contributions by the following outstanding personalities in the industry are scheduled:

Dr. F. C. Bishopp
Dr. E. N. Cory
Dr. J. J. Davis
Dr. G. C. Decker
Dr. B. Gleissner
Dr. E. F. Knipling
Dr. E. R. McGovern
Dr. R. L. Metcalf
Dr. C. E. Palm

Barberry Eradication



By R. O. Bulger

U. S. Department of Agriculture
Minneapolis, Minn.

Stem rust that develops on the barberry is spread to wheat, oats, barley and rye. Stem rust reduces yield and quality of small grain.

RUST-spreading barberry has been a problem to the small grain industry of North America since it was introduced by colonists some two hundred years ago. The fungus that lives alternately on certain species of barberry and on grains and grasses causes the plant disease stem rust. It is spread between the host plants by windborne spores. In addition to the European barberry (*Berberis vulgaris*), there are two native species that spread stem rust—the Allegheny barberry (*B. canadensis*), which is confined largely to the Virginias and North Carolina, and the Colorado barberry (*B. fendleri*), which is found primarily in southwestern Colorado and adjacent areas in New Mexico, Arizona, and Utah. After its introduction into the American colonies, the European barberry became widespread throughout the important grain-growing areas in the United States before cooperative action was taken to destroy it.

Farmers were the first to observe that stem rust was caused by the barberry, and even prior to the Revolutionary War laws were passed condemning this bush. However, it was not until 1865 that research workers proved definitely the part that the barberry plays in the development and spread of this disease of wheat, oats, barley, and rye. The practical importance of the discovery was overlooked for many years, and not until 1918, after this plant pest had become widely distributed and yearly rust losses became serious, was a program for its eradication started. Thirteen states—Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, N. Dakota, S. Dakota, Ohio, Wisconsin, and Wyoming—started barberry eradication in cooperation with the U. S. Department of Agriculture. Missouri, Pennsylvania, Virginia, and West Virginia came into the program in 1935, and in 1944 Washington was added. Barberry eradication is a cooperative project, with Federal, State, and local agencies participating.

During the early years of the barberry-eradication program, many problems were encountered. The most urgent of these was the need for an effective and economical method of eradication. Grubbing and digging were not satisfactory, because of the abundant regrowth that developed from root fragments left in the soil.

Experiments with chemicals designed to find a barberry herbicide were started by the U. S. Department of Agriculture in the fall of 1921 and continued through 1925. Of the 37 chemicals tested, including inorganic salts, acids and acid formers, gas-forming substances, and oils, several were found to be effective. Following these tests, common salt was selected for general use. Kerosene and sodium arsenite were also found to be toxic to barberry bushes. The latter, although very effective, is poisonous to livestock and because of this danger was not used extensively. Heavy oils failed to give uniformly satisfactory results. In the early thirties ethylene oxide, acetic acid, and ammonium thiocyanate were tried. They were found to be only partially effective and too expensive for general use.

Following tests made in 1944, ammonium sulfamate was adopted for field use in killing the European barberry. The canes are cut off at the ground level and a very small amount of the chemical placed on each cut-off cane. Two ounces will kill a bush that would require 20 to 30 pounds of dry salt. In areas where there are only scattered, isolated bushes, a worker can carry sufficient Ammate in a small container to treat the bushes that he will find during a half-day period.

In the field, MCP (2-methyl, 4-chlorophenoxyacetic acid) has given satisfactory control of the European barberry. The bushes may be treated at all seasons of the year, and the treatment is most effective when applied at the base of the canes and at the ground line. Field tests have also

shown that 2 parts 2,4-D and 1 part 2,4,5-T plus pentachlorophenol is almost as effective as the MCP. With both of these materials, a 2-per cent oil solution, or about 14 pounds of acid equivalent in 100 gallons of oil, is most effective. Other tests show that esters of 2,4,5-T and Cloro-IPC (chloroisopropyl carbamate) also may be utilized in killing the European barberry. The hormone sprays are effective on a year-round basis.

When the barberry-eradication project was extended to the Virginias and southwestern Colorado in 1935, the eradication of the native species of barberry presented a new problem. Tests were made immediately with sodium chlorate, sodium chlorate plus borax, "Atlacide" (a proprietary product containing sodium chlorate plus a fire-inhibiting substance), diesel oil, ammonium thiocyanate, sodium hydroxide, sulfuric acid sludge, and salt brine. Sodium chlorate and "Atlacide" were both found to be effective in killing the native species of barberry in Colorado and the Virginias, but they were costly and unpleasant to handle. However, the "Atlacide" was the most generally satisfactory; and adopted for use in Colorado and the Virginias. Ammonium sulfamate in water solution is effective against the native barberry, but its cost of application made its use impractical.

2,4-D sprays have proved to be effective against the native barberry in Colorado. A water emulsion of low-volatile ester of 2,4-D (2,000 parts per million) is used as a foliage spray during the season when the plants are producing new growth, and a 1.5-per cent oil solution is applied when the plants are dormant (September through April). In the Virginias, the native barberry requires a different formulation—a mixture containing 2 parts 2,4-D and 1 part 2,4,5-T plus a penetrant. A 1-per cent solution in oil is used on the foliage from May to August, and a dormant spray, 1.5 per cent in oil, is used during the remainder of the year.

The new barberry herbicides and the power-driven and hand-operated



The lighter colored spots are areas of native barberry in Virginia, killed with hormone sprays. Erosion is not a problem, as bluegrass and other vegetation covers the bare spots within a year.



Barberry plants hold their leaves late in the season. They can be recognized readily when snow is on the ground. Chemical control is effective at all seasons of the year.

sprayers have eliminated the burdensome and costly job of trucking and back-packing large quantities of salt. Power sprayers are used for large infestations and hand sprayers for small areas and scattered single bushes. The power sprayers are of the compressed-air type and are mounted on 4-wheel-drive trucks that can be driven right to most of the infested areas. The costs of eradication have gone down. In Pennsylvania, 12,000 medium to large European barberry bushes were treated for less than $500 for the chemical and its application. With the old-time chemicals, the cost of the chemical alone would have exceeded $500. The use of hormone-type chemicals has made it possible to step up eradication 500 per cent in areas where bushes are numerous.

In the 18 states where cooperative barberry-eradication programs are conducted, farmers produce 2 billion bushels of wheat, oats, barley, and rye on 75 million acres each year. These crops represent more than 2 billion dollars of annual farm income. Since the inception of this work, 448 million barberry bushes have been destroyed on 146,555 rural and urban properties. Of the 1,033,457 square miles in these states that required work, 1,004,112 square miles have had the initial coverage and more than 300,000 square miles have been reworked one or more times. There remain 29,345 square miles that require initial work and 48,058 square miles that need rework one or more times. The more than 900,000 square miles now on maintenance will require only sufficient work in the future to hold the high degree of barberry and stem-rust control that has been attained.

In the developmental stage of stem rust on the barberry, races of the rust fungus are also produced and perpetuated. These races, which are designated by number, differ in their ability to attack varieties of grain. In special studies made in Pennsylvania and Virginia, as many as 30 different stem-rust races were identified from a single spread of rust from a few barberry plants. Data accumulated over a 20-year period show that 10 times as many different races have been

(*Turn to Page* 147)

Fertilizer Consumption in the United States, 1952-53

by

Walter Scholl, Hilda M. Wallace & Esther I. Fox

Fertilizer and Agricultural Lime Section
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Table 1. - Consumption of fertilizers, Year Ended June 30, 1953 1/

State & Region	Mixtures			Materials 2/			All Fertilizers 1952-53	Relative Consumption 1951-52 = 100	
	July 1 - Dec. 31, 1952	Jan. 1 - June 30, 1953	Total	July 1 - Dec. 31, 1952	Jan. 1 - June 30, 1953	Total		Fertilizers 1/	Total N, Avail. P_2O_5 & K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	30,480	171,700	202,687	1,988	7,073	10,058	211,805	99	101
New Hampshire	1,997	13,838	15,832	780	2,588	3,374	21,206	100	120
Vermont	11,197	44,251	55,448	1,494	6,041	14,515	69,773	88	91
Massachusetts	9,840	18,466	28,306	4,340	12,332	17,291	45,378	93	94
Rhode Island	1,308	11,979	13,286	630	1,027	1,657	15,211	91	93
Connecticut	8,430	30,749	39,809	2,704	13,882	17,746	57,808	102	101
New England	63,451	290,975	355,368	21,936	52,739	74,675	431,201	97	99
New York	118,611	394,217	517,601	61,838	81,325	144,023	661,967	104	106
New Jersey	85,751	190,747	249,498	9,691	18,807	27,998	277,496	105	108
Pennsylvania	200,475	647,160	847,635	47,776	61,380	109,156	957,791	108	108
Delaware	10,167	20,638	30,805	804	2,294	3,198	34,003	113	111
District of Columbia	506	1,351	1,857	170	680	850	2,707	102	102
Maryland	70,481	208,630	281,111	7,972	14,801	22,774	303,885	102	104
West Virginia	35,752	94,382	130,134	4,704	12,840	17,544	147,677	97	99
Middle Atlantic	521,743	1,557,125	2,078,868	80,955	205,781	286,736	2,365,604	106	107
Virginia	173,785	564,847	738,632	24,535	89,370	113,905	852,537	97	100
North Carolina	413,771	1,393,761	1,807,532	77,776	296,364	374,140	2,181,672	98	99
South Carolina	222,000	800,000	1,022,000	84,582	211,498	296,077	1,318,077	100	100
Georgia	237,000	816,672	1,053,672	85,305	194,291	279,597	1,333,269	100	100
Florida	405,000	662,000	1,067,000	24,755	61,817	86,572	1,153,572	110	111
South Atlantic	1,451,556	4,237,280	5,688,836	296,953	842,340	1,139,293	6,828,129	102	103
Ohio	372,711	733,215	1,105,926	25,050	81,710	106,777	1,212,703	122	123
Indiana	257,000	700,470	1,003,447	37,336	103,310	140,646	1,144,093	111	110
Illinois	371,788	672,525	944,313	103,305	303,999	407,304	1,351,617	115	120
Michigan	100,002	304,881	404,883	10,907	47,725	58,632	463,515	110	114
Wisconsin	58,572	158,737	217,309	18,287	28,291	46,578	263,888	108	109
East North Central	1,160,073	2,569,827	3,729,900	203,304	564,035	767,939	4,497,839	112	116
Minnesota	91,170	170,677	261,847	17,603	51,454	69,057	330,904	118	120
Iowa	89,510	313,490	403,000	80,215	106,705	187,920	590,920	128	130
Missouri	156,233	322,041	478,274	170,570	106,260	276,830	755,104	131	134
North Dakota	6,000	10,706	16,706	2,565	14,200	16,765	33,471	120	128
South Dakota	200	3,245	3,445	2,526	8,000	10,526	13,971	107	110
Nebraska	13,000	38,193	51,193	31,267	84,200	115,467	166,660	108	111
Kansas	59,858	83,833	143,691	82,390	68,200	150,590	294,281	116	122
West North Central	366,769	942,185	1,308,954	388,879	588,819	977,697	2,286,651	120	130
Kentucky	64,711	170,971	235,682	20,474	111,167	131,641	367,323	97	103
Tennessee	85,430	171,370	256,800	41,200	202,210	243,410	500,210	96	100
Alabama	124,965	333,720	458,685	170,872	270,900	441,772	900,457	96	98
Mississippi	30,700	113,561	144,261	103,700	237,166	340,866	485,127	98	98
East South Central	305,806	789,622	1,095,428	336,246	821,443	1,157,689	2,253,117	96	99
Arkansas	21,000	179,076	200,076	83,477	113,411	196,888	396,964	118	119
Louisiana	31,717	138,616	170,333	44,839	83,243	128,082	298,415	98	99
Oklahoma	19,980	84,496	104,476	32,838	55,803	88,641	193,117	90	100
Texas	82,500	210,972	293,472	183,000	190,000	373,000	666,472	93	94
West South Central	155,197	613,160	768,357	344,154	442,457	786,611	1,554,968	95	98
Montana	700	3,000	3,700	8,587	16,257	24,844	28,544	114	115
Idaho	800	13,000	13,800	15,216	48,000	63,216	77,016	113	110
Wyoming	333	2,000	2,333	1,651	7,100	8,749	11,082	172	174
Colorado	2,150	15,500	17,650	5,500	21,900	27,400	45,050	100	99
New Mexico	750	1,750	2,500	9,000	10,500	19,500	22,000	100	100
Arizona	6,170	10,130	16,300	20,218	74,313	94,531	110,831	100	102
Utah	980	5,870	6,850	7,250	21,440	28,690	35,540	104	103
Nevada	110	300	410	2,780	3,372	6,152	6,562	102	102
Mountain	11,993	51,550	63,543	69,502	204,911	274,413	337,956	110	110
Washington	5,007	25,301	30,308	22,765	45,209	67,974	98,282	134	141
Oregon	3,500	14,141	17,641	18,599	51,196	69,795	87,436	109	112
California	44,854	183,791	228,645	270,074	831,139	1,101,213	1,329,858	104	106
Pacific	53,361	223,233	276,594	311,438	927,544	1,238,982	1,515,576	110	113
Continental U. S.	4,088,950	11,275,350	15,364,300	1,711,260	4,650,268	6,361,528	21,725,828	104	109
Hawaii	24,477	23,334	47,811	14,778	16,800	31,578	79,389	112	114
Puerto Rico	406,181	107,700	513,881	41,282	69,455	110,737	624,618	96	98
Alaska	0	130	130	0	117	117	247	110	110
Territories	430,658	131,164	561,822	56,060	86,372	142,432	704,254	98	100
United States	4,519,608	11,406,514	15,926,122	1,767,320	4,736,640	6,503,960	22,430,082	104	109
Islands	1,817,418	13,803,283	15,620,701	2,816,289	4,804,111	7,620,400	23,241,101	100	100
Mainland	2,702,190	81,891,809	84,593,999	4,949,031	44,932,529	49,881,560	134,475,559	94	94

1/ Tonnages include primary plant nutrients, basic slag, secondary and trace element materials, such as, borax, sulfur, magnesium sulfate, etc., used as separate materials, also fertilizers distributed by government agencies. Does not include liming materials, but includes gypsum.

2/ Includes the quantities of materials used for manufacture of commercial mixtures.

3/ Fertilizers which were guaranteed to contain primary plant nutrients in P_2O_5 form.

CONSUMPTION of commercial fertilizers in the United States, including the Territories (Hawaii, Puerto Rico, Alaska) for the year ended June 30, 1953, amounted to 23,412,608 tons. This quantity represents an increase of 4.4 per cent or 980,190 tons more than the 22,432,418 tons consumed in the 1951-52 season. In 1952-53, of the total consumed, 15,722,224 tons were commercial mixtures, 6,812,897 tons were separate materials containing primary nutrients (N, P_2O_5, K_2O), and 877,487 tons were secondary and trace element materials having no primary nutrients. The consumption of these classes of fertilizers was 4.2 per cent, or 635,875 tons; 3.8 per cent, or 251,878 tons; and 11.8 per cent, or 92,437 tons more than the corresponding classes for the 1951-52 season.

Fertilizers consumed in 1952-53 contained a total of 5,648,016 tons of primary nutrients. This is 445,013 tons (8.6 per cent) more than the revised total of 5,203,003 tons consumed in 1951-52. Fertilizers consumed in 1952-53 contained 1,637,056 tons of nitrogen, 2,270,750 tons of available P_2O_5, and 1,740,210 tons of K_2O. These quantities represented a net increase for nitrogen of 214,896 tons (15.1 per cent), for

available P_2O_5 71,374 tons (3.2 per cent), and for K_2O 158,743 tons (10.0 per cent) over 1951-52. The total content of P_2O_5 in all fertilizers consumed was 2,767,990 tons. The weighted average total primary nutrient content in all commercial mixtures consumed in 1952-53 was 25.85 per cent as compared with 24.86 per cent in 1951-52. For all fertilizers containing primary nutrients, it was 25.06 per cent in 1952-53 as compared with 24.04 per cent in 1951-52.

The tabulations presented herein were prepared from reports submitted by manufacturers to the Fertilizer and Agricultural Lime Section, showing the number of tons of fertilizer shipments for consumption in agriculture throughout the forty-eight States and the Territories. Supplementary information was furnished by the State fertilizer control officials and agronomists. All of this assistance is gratefully acknowledged. The word "ton" means the short ton of 2,000 pounds.

Consumption

THE total consumption of the two principal classes of fertilizers, mixtures and materials, is summarized by States and regions in Table 1. Although the use of fertilizers in 1952-53 for the United States as a whole showed a net gain of 4.4 per cent over 1951-52, consumption in fourteen States and Puerto Rico was from one to 15 per cent below 1951-52. In most of the States of the New England and South Central regions, consumption of fertilizers was below the level established in 1951-52 for both mixtures and materials. In Kentucky and Tennessee, however, consumption of materials was higher than in 1951-52, while in Louisiana consumption of mixtures was higher. The total consumption for these states, nevertheless, was below that of 1951-52. Total consumption in three states of these regions, Arkansas, Connecticut, and New Hampshire, was equal to or above their consumption in 1951-52.

The percentage increases in consumption averaged highest in the West North Central region, followed by the East North Central, Mountain, and Pacific regions, in the order named. Consumption of primary nutrient fertilizers in states of these regions rose from one to 72 per cent with average increases for these regions of 20, 12, 10, and 9 per cent, respectively. In tonnage of primary nutrient fertilizers, increases were highest for the East and West North Central regions. Consumption in these regions was 548,341 tons and 344,457 tons above their 1951-52 consumption, respectively.

In the South Atlantic region where the largest tonnage of primary nutrient fertilizers is used, increases in consumption have grown smaller during the past three years. Consumption in 1950-51 was 582,997 tons above the 1949-50 level, in 1951-52, it was but 178,750 tons above 1950-51, and in 1952-53, it was but 93,534 tons above 1951-52.

Mixtures

THE total of all commercial mixtures consumed in the United States and territories amounted to 15,722,224 tons comprising 1,439 grades reported by their guaranteed analysis and approximately 300 grades the

Table 2. - Consumption of Principal Used Fertilizers in the Continental United States, by Grades, Years Ended June 30, 1953 and 1952

Grade	Consumption		Proportion of Total	
	1952-53	1951-52	1952-53	1951-52
	Tons	Tons	Percent	Percent
0-45-0	6,025	4,510	.03	.03
0-46-0	22,897	20,000	.17	.16
0-47-0	8,194	6,835	.08	.05
0-48-0	61,197	61,780	.61	.62
0-49-0	30,526	22,063	.23	.18
0-50-0	6,780	3,023	.06	.02
0-52-0	125,021	191,100	.90	1.29
0-58-0	2,260	2,060	.02	.01
0-60-0	25,052	20,307	.17	.10
0-62-0	6,076	4,241	.04	.03
0-68-0	3,562	3,901	.03	.03
0-69-7	76,532	101,198	.49	.56
0-69-10	39,706	45,538	.27	.29
0-69-14	268,250	320,641	1.72	2.01
0-69-30	11,737	10,178	.01	.01
0-69-50	12,865	8,330	.08	.06
0-70-0	9,048	8,691	.06	.06
0-76-24	5,927	9,845	.04	.06
0-82-19	2,678	1,600	.02	.01
0-82-24	68,770	61,266	.49	.38
0-82-30	304,962	231,657	1.97	1.46
0-84-16	3,127	1,079	.02	.01
0-88-24	3,809	3,062	.02	.02
0-90-0	4,552	1,675	.03	.01
0-92-0	8,158	6,606	.05	.04
0-100-0	7,797	7,310	.05	.05
2-12-6	389,630	237,886	2.51	1.51
2-14-14	419,213	432,717	2.71	2.72
2-16-8	3,500	13,043	.02	.09
2-20-0	9,441	13,355	.06	.09
2-48-0	16,000	27,282	.11	.18
3-9-9	671,218	808,858	4.34	5.09
3-9-18	434,599	407,438	2.80	2.75
3-12-12	37,745	45,804	.24	.29
3-14-14	7,051	6,571	.05	.04
3-15-15	194,740	163,302	1.26	1.04
3-16-7	119,078	78,571	.76	.49
3-18-6	5,854	836	.03	(1/)
3-18-10	3,486	3,860	.02	.02
3-18-12	3,710	10,231	.02	.07
3-18-18	870,317	882,484	5.61	5.67
3-20-10	2,641,137	2,551,710	16.50	15.41
3-20-20	118,515	107,327	.76	.73
4-8-7	2,701	2,708	.02	.02
4-8-8	8,160	7,711	.05	.05
4-8-12	17,281	12,350	.11	.08
4-8-16	11,257	71,062	.07	.45
4-8-20	130,515	119,312	.85	.81
4-9-7	3,372	0	.02	(1/)
4-9-9	11,736	10,832	.07	.07
4-9-21	201,175	151,006	1.31	1.02
4-9-28	331,412	265,273	2.15	1.79
4-10-6	13,060	14,561	.01	.07
4-10-12	75,126	21,060	.49	.14
4-10-20	77,178	81,980	.50	.55
4-12-4	101,850	102,204	.70	.69
4-12-8	167,096	109,696	1.01	.74
4-12-12	1,996	1,177	.01	.01
4-12-20	9,616	7,805	.06	.05
4-12-24	154,111	167,163	1.04	1.07
4-12-28	7,206	8,730	.05	.06
4-12-36	10,804	255,716	1.04	1.61
4-12-38	204,561	84,556	1.32	.56
4-12-48	3,420	3,884	.02	.03
4-16-8	25,592	44,197	.17	.29
4-16-16	71,235	64,740	.46	.43
4-16-20	472,308	419,424	3.06	2.81
4-16-28	61,256	88,282	.41	.59
4-16-32	8,532	3,556	.06	.02
4-16-48	7,501	10,503	.05	.07
4-20-0	9,782	7,601	.06	.05
4-20-8	6,161	5,174	.04	.03
4-20-20	22,677	16,577	.17	.11
4-24-12	9,092	7,886	.06	.05
4-24-24	13,751	25,281	.11	.17
4-24-28	8,532	3,882	.06	.03
4-24-40	277,680	308,345	1.80	2.05
5-10-15	1,115,741	881,365	7.22	5.83
5-10-25	15,023	10,230	.10	.07
5-12-13	15,118	11,578	.11	.07
5-12-20	3,700	3,440	.02	.02
5-15-13	65,821	9,864	.43	.06
5-15-15	9,956	11,621	.06	.08
5-15-30	9,013	7,257	.06	.05
5-20-10	17,147	16,532	.11	.11
5-20-20	87,476	61,965	.57	.41
5-20-30	22,110	23,139	.14	.15
6-6-6	8,053	6,301	.05	.04
6-8-8	18,098	10,574	.09	.07
6-8-12	3,304	3,830	.02	.02
6-8-12	1,532	30	.02	(1/)
6-8-8	79,820	70,380	.51	.46
6-8-8	16,966	19,736	.11	.13

Grade	Consumption		Proportion of Total	
	1952-53	1951-52	1952-53	1951-52
	Tons	Tons	Percent	Percent
6-8-8	3,152	2,158	.02	.01
6-8-10	2,548	1,121	.02	.01
6-8-12	4,617	1,704	.03	.01
6-8-18	1,729	2,241	.01	.01
6-8-24	8,226	6,414	.05	.04
6-8-7	115,173	230,366	1.20	1.56
6-8-8	239,870	253,802	1.80	1.70
6-8-8	178,126	250,815	1.79	1.68
6-8-8	61,040	53,925	.35	.30
6-8-12	1,878	1,302	.01	.01
6-8-10	6,878	6,841	.04	.04
6-8-5	5,093	6,841	.03	.03
6-8-6	11,850	13,761	.09	.09
6-8-8	9,171	9,770	.05	.07
6-8-8	70,040	89,188	.40	.57
6-8-4	20,818	11,800	.20	.08
6-10-6	8,827	5,240	.05	.03
6-10-10	5,126	6,255	.03	.04
6-12-6	5,093	5,867	.03	.04
6-12-8	15,098	10,067	.09	.06
6-12-12	165,000	138,000	1.07	(1/)
6-12-18	3,672	0	.03	(1/)
6-12-24	20,626	13,990	.20	.09
6-24-6	12,805	10,830	.15	.07
6-24-12	6,116	3,161	.06	.02
6-24-24	2,555	1,612	.02	.01
6-30-6	2,575	61	.02	(1/)
7-7-7	1,910	20	.02	(1/)
7-14-14	30,852	37,406	.23	.25
7-20-7	3,211	---	.02	---
7-20-8	17,082	19,198	.08	.12
8-8-8	10,127	3,084	.07	.02
8-8-12	18,847	21,828	.12	.15
8-8-24	2,878	3,382	.02	.02
8-24-8	11,823	11,807	.07	.07
8-24-24	2,714	225	.02	(1/)
8-32-8	2,863	2,879	.02	.02
8-32-16	3,529	3,522	.02	.02
8-32-32	4,933	5,114	.03	.03
8-40-8	2,722	10,180	.02	.07
8-40-8	20,192	21,325	.13	.14
8-40-8	342,262	286,186	2.21	1.83
8-40-8	6,047	3,587	.04	.02
8-40-12	12,911	11,514	.08	.08
8-40-12	15,118	16,171	.10	.10
8-40-14	9,869	10,626	.06	.07
8-40-16	3,680	4,761	.02	.03
8-40-16	67,260	63,770	.43	.41
8-40-8	105,161	83,819	.68	.54
8-40-8	17,178	17,111	.11	.11
8-40-8	2,632	304	.02	(1/)
9-9-8	14,475	9,238	.09	.06
9-9-9	9,737	6,934	.06	.04
9-9-9	6,355	6,264	.04	.04
9-20-9	14,396	18,161	.09	.12
10-10-10	3,613	6,536	.02	.04
10-10-10	3,111	1,306	.02	.01
10-10-10	3,111	1,306	.02	.01
10-10-10	10,615	11,716	.07	.08
10-10-10	10,557	10,908	.07	.07
10-10-10	27,367	20,721	.18	.13
10-10-10	400,382	359,602	2.58	2.32
10-10-10	6,810	3,431	.04	.02
10-10-10	5,557	4,815	.04	.03
10-10-15	13,460	13,860	.07	.07
10-10-20	142,201	66,676	.78	.43
10-20-10	43,216	32,718	.15	.09
10-20-20	6,970	3,716	.04	.02
10-30-10	5,501	11,366	.04	.08
10-30-13	12,504	9,170	.08	.06
12-12-12	10,307	6,861	.07	.05
12-12-12	4,443	217	.03	(1/)
12-24-6	2,012	1,007	.02	.01
12-24-8	2,053	355	.02	.01
12-24-12	72,307	32,176	.47	.21
12-24-24	8,882	5,155	.05	.03
12-24-24	20,551	20,552	.09	.17
12-24-12	15,796	207	.10	(1/)
16-16-16	30,762	28,031	.20	.17
16-16-8	2,108	0	.01	---
16-16-8	2,278	2,567	.02	.02
16-20-12	2,572	1,067	.02	.01
16-20-16	14,643	12,819	.08	.08
16-20-24	24,836	7,126	.11	.05
16-24-16	2,572	121	.02	.01
16-24-32	30,027	27,407	.21	.18
17-7-7	1,000	0	.01	---
177 mixtures	15,280,803	14,930,500	97.43	97.90
Minor specified grades 2/	250,554	201,000	1.60	1.32
Grades not shown 3/	120,643	69,113	.81	.80
Total 4/	15,888,992	14,938,868	100.00	100.00

1/ Less than half percent.
2/ There were 1,189 in 1952-53 and 994 in 1951-52.
3/ There were, at least, 300 grades not shown by their guaranteed analysis.
4/ Does not include the quantity of mixtures consumed in the Territories.

guaranteed analysis of which were not reported. Consumption of mixed fertilizers in 1952-53 was 635,875 tons (4.2 per cent) more than the 15,086,349 tons consumed in 1951-52. The quantity of mixtures consumed in the current year also represents 67.15 per cent of all fertilizers consumed in the United States and the territories.

The grades of commercial mixtures reported consumed in amounts of 2,500 tons or more in continental U.S. in 1952-53, and their consumption in 1951-52, are shown in Table 2. There were 177 of these grades, totaling 15,066,403 tons in 1952-53 and accounting for 97.49 per cent of the total quantity of mixtures consumed in continental U.S. Other grades, numbering 1,149, totaling 258,881 tons, and approximately 300 grades, not reported by their guaranteed analysis and totaling 128,663 tons, were also consumed. In addition, 268,272 tons, not included in Table 2, were consumed in the territories. Grades consumed in the territories are not included in Table 2, because those consumed in Hawaii were reported in fractional numbers and the principal grades consumed in Puerto Rico were not the kind generally used in continental U.S.

The four grades most favored in continental U.S. were the 3-12-12,

Table 1. - Consumption of Mixed Fertilizers, by Grades, in Each State and Region
Year Ended June 30, 1953[1/]

State	Fifteen Principal Grades Consumed in Regions (Tons)														All Other Grades		Total Tons
															Number[2/]	Tons	
New England																	
Maine	70,280	28,780	34,806	--	55	4,070	6,060	13,783	12,877	775	653	2,171	88	740	5,057	41	21,252	202,647
New Hampshire	--	2,850	100	--	1,525	885	2,690	930	183	210	200	--	1,043	580	--	20	2,057	10,303
Vermont	--	6,970	255	6	19,376	706	6,024	340	108	652	782	--	2,600	1,110	--	31	3,430	33,040
Massachusetts	--	17,570	157	7,056	3,855	7,650	2,800	1,080	621	2,661	5,305	--	661	2,615	--	31	15,183	60,098
Rhode Island	--	2,161	--	--	661	1,313	70	85	580	665	1,076	--	80	112	--	17	1,014	10,706
Connecticut	--	10,896	92	16,645	1,006	2,836	1,060	761	1,006	2,830	3,144	--	3,160	1,631	--	45	12,817	53,904
Total	70,280	69,227	35,409	23,716	25,050	17,457	19,504	16,979	15,373	7,993	11,160	5,173	7,992	6,813	5,057	93	57,951	382,698
Middle Atlantic																	
New York	147,190	80,780	150,920	68,190	21,890	13,250	8,865	61,821	511	--	9,332	13,826	187	1,966	9,016	61	36,880	517,830
New Jersey	165,656	6,713	81,199	8,661	2,770	967	2,210	761	7,263	--	809	6,700	74	14,227	1,280	47	23,475	289,699
Pennsylvania	198,280	108,853	89,057	28,764	20,719	9,715	16,870	5,809	1,366	6,994	18,713	1,236	28,723	980	6,784	69	80,617	528,108
Delaware	19,884	6,819	2,621	2,682	859	2,767	1,572	--	2,178	4,227	1,044	183	300	1,733	1,273	21	10,536	61,890
District of Columbia	40	173	214	47	--	120	0	--	0	0	--	--	--	--	1	10	960	1,967
Maryland	65,890	60,431	25,280	6,473	2,606	10,913	11,561	--	6,909	14,661	831	1,935	1,051	6,890	1,918	42	30,466	251,111
West Virginia	16,186	16,680	3,096	1,219	2,832	8	2,395	--	6,631	1,650	126	2	94	--	409	25	14,268	70,096
Total	606,226	319,272	364,749	91,843	50,123	40,740	44,274	68,391	31,862	27,444	30,011	23,247	24,444	25,708	18,781	146	181,767	1,814,944
South Atlantic																	
Virginia	670	90,809	--	5,039	172,960	0	69,821	71,830	--	18,962	120,082	--	62,761	60	--	39	121,762	730,435
North Carolina	276,746	277,070	--	144,758	100,064	170	148,189	47,256	--	76,940	686	--	29,871	10	--	24	230,000	1,827,532
South Carolina	204,000	68,816	--	207,810	--	20,253	9,847	58,140	6,870	7,000	2,324	--	1,650	71,650	--	24	27,750	730,094
Georgia	1,564	17,091	411,041	31,655	27,724	176,080	29,742	7,190	164,166	28,210	2,196	1	1,965	7,850	7	110	141,940	1,187,683
Florida	594	6	14,647	1,573	3,195	86,248	3,876	7,680	1,540	7,717	4,256	170,918	1,934	2,165	73,721	709	667,998	1,051,756
Total	483,574	441,377	681,469	390,874	373,743	282,751	260,951	191,896	172,576	138,849	147,544	170,919	107,983	80,735	73,728	909	1,181,890	5,528,173
East North Central																	
Ohio	600,800	18,109	32,776	36,919	120,660	11,807	3,612	21,877	310	60,153	12,006	13,691	813	1,963	1,197	62	16,476	1,353,826
Indiana	529,250	568,677	71,939	38,823	21,164	12,622	15,317	62,962	23,276	3,966	15,126	6,213	5,156	17,156	3,612	66	37,863	1,385,447
Illinois	861,313	311,250	89,788	27,116	1,380	4,08	23,582	23,183	31,358	1,574	1,134	2,565	3,280	4,611	7,373	66	52,219	646,091
Michigan	290,171	49,586	15,870	27,275	10,162	60,096	10,172	9,525	1,340	16,550	7,006	2,306	4,823	1,306	12	64	24,380	183,644
Wisconsin	158,761	42,566	25,138	43,239	145	15,700	22,678	340	11,796	--	22,847	500	22,847	1,500	52	64	25,964	377,529
Total	2,000,295	990,178	235,491	171,372	153,514	104,704	85,500	96,907	67,878	72,511	58,350	25,851	35,636	26,634	12,171	321	156,111	3,736,290
West North Central																	
Minnesota	16,000	65	1,105	37,011	--	0	27,200	1,042	2,150	2,217	21,069	31	13,131	296	1,140	67	70,662	235,967
Iowa	60,670	1,006	20,829	26,721	1,947	6,222	811	17,796	25,999	60,621	9,522	6,736	10,250	3,567	47,321	69	67,827	366,540
Missouri	68,159	66,208	1,000	6,982	61,804	64,195	25,526	92	15,250	68	20,667	15,068	39	1,150	--	51	73,636	400,873
North Dakota	882	--	150	280	--	--	5,652	2,748	217	--	152	--	90	10	177	19	1,346	10,904
South Dakota	67	151	4,982	0	0	10	242	716	60	175	0	--	0	220	141	28	1,363	7,921
Nebraska	191	700	12,900	--	240	20	0	7,961	98	132	613	217	45	15,510	230	46	22,703	49,619
Kansas	1,931	17,336	30,120	--	6,880	1,994	1,530	15,096	1,987	10	200	134	10	15,058	21	20	12,881	110,781
Total	148,319	104,480	81,083	70,486	70,871	71,530	65,860	62,706	45,797	63,223	54,715	41,186	23,551	36,194	51,049	181	241,363	1,355,829
West South Central																	
Kentucky	--	1,264	15	1,218	36,389	5,128	41,236	4,181	75,961	66,217	22,859	46,497	19,971	8,455	67	66	134,617	466,080
Tennessee	366	7,522	6,694	5,630	43,368	57,980	28,879	1,107	2,853	8,529	19,765	6,631	26,171	10,165	31,863	66	76,911	417,830
Alabama	467,857	64,236	195,367	2,352	1	64	6	58,643	16	6	4,80	1	37	6,775	110	61	60,990	860,724
Mississippi	1,000	167,361	7,750	161,780	--	--	126	7,053	98	--	6,550	0	39	14,163	--	26	9,660	550,721
Total	471,223	219,660	209,875	170,980	170,362	103,570	87,746	81,780	78,915	68,752	53,770	49,850	46,218	39,807	31,750	119	240,908	1,828,654
West South Central																	
Arkansas	51,283	7,780	9,407	8,985	26,316	1,983	20,820	3,047	1,940	6,080	177	15,059	--	1,945	2,014	22	18,423	196,946
Louisiana	35,893	32,099	12,175	30,067	1,301	2,582	267	5,052	1,589	826	21,175	--	2,106	2,880	2,008	31	32,181	180,131
Oklahoma	20,570	201	10,221	1,522	23	324	736	2,080	160	1,987	2	--	1,221	2,155	253	22	13,779	53,435
Texas	118,571	20,665	10,788	7,485	900	80,772	--	15,934	2,448	5,820	26	--	2,580	3,636	4,784	70	40,156	293,109
Total	226,609	72,965	66,567	48,619	28,539	85,904	29,823	26,161	16,244	14,382	21,382	15,059	11,910	11,216	10,079	113	90,479	723,794
Mountain																	
Montana	--	2,703	--	11	117	--	410	--	--	104	--	--	--	--	--	16	320	3,919
Idaho	8,181	1,088	--	317	200	1,220	660	--	1,020	431	--	--	--	--	980	23	982	14,404
Wyoming	30	322	670	--	120	20	27	--	--	102	24	--	--	8	--	16	1,023	2,016
Colorado	--	1,184	2,282	2,427	231	63	725	271	--	224	67	--	--	220	--	46	2,900	12,840
New Mexico	37	201	--	--	116	--	--	--	--	--	150	--	--	--	--	17	1,230	2,540
Arizona	2,240	2,907	--	--	--	220	--	1,020	--	--	1,020	1,220	1,220	--	--	43	7,240	14,908
Utah	107	112	--	2	1,272	41	270	--	42	70	--	--	--	1	17	22	472	2,215
Nevada	--	109	--	--	272	80	--	--	--	--	--	--	4	--	--	12	127	710
Total	10,831	12,010	2,707	2,788	2,213	1,888	2,880	1,864	1,881	1,001	1,304	1,220	1,060	980	998	134	15,994	71,211
Pacific																	
Washington	1,825	830	--	--	1,020	--	2,218	--	800	170	97	--	--	82	830	29	15,812	30,869
Oregon	814	--	--	182	691	--	1,440	--	210	6,020	729	--	--	241	1,278	76	7,130	18,420
California	31,830	31,290	10,274	16,218	7,720	11,017	--	8,662	6,886	--	4,216	3,308	4,270	3,690	880	304	102,819	245,028
Total	33,469	32,120	10,274	16,304	10,431	11,017	3,666	8,662	7,716	6,190	5,042	3,308	4,270	3,913	2,987	409	125,760	294,317
Territories[3/]																	
Puerto Rico	27,980	24,012	22,495	17,162	14,400	12,126	10,721	10,098	8,427	8,032	8,827	5,878	6,980	5,027	3,794	30	10,040	208,703
Alaska	26	22	20	22	20	10	10	7	2	--	--	--	--	--	--	0	0	139

1/ Dash indicates no data was reported.

2/ The number of mixtures shown for each State and Region is exclusive of mixtures not specified by grade, although their tonnages are included in the totals.

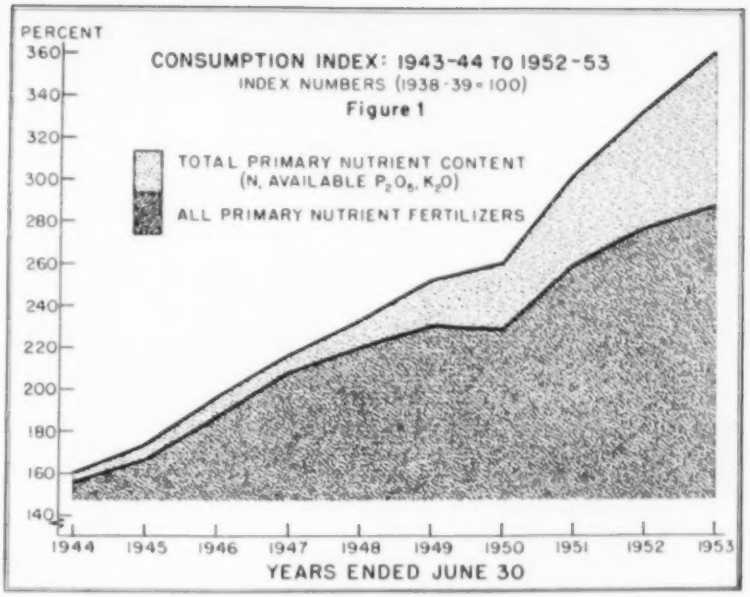
3/ The total consumption in Hawaii was 59,455 tons of mixed grade, comprising 55 grades, which were manufactured to consumer's specifications.

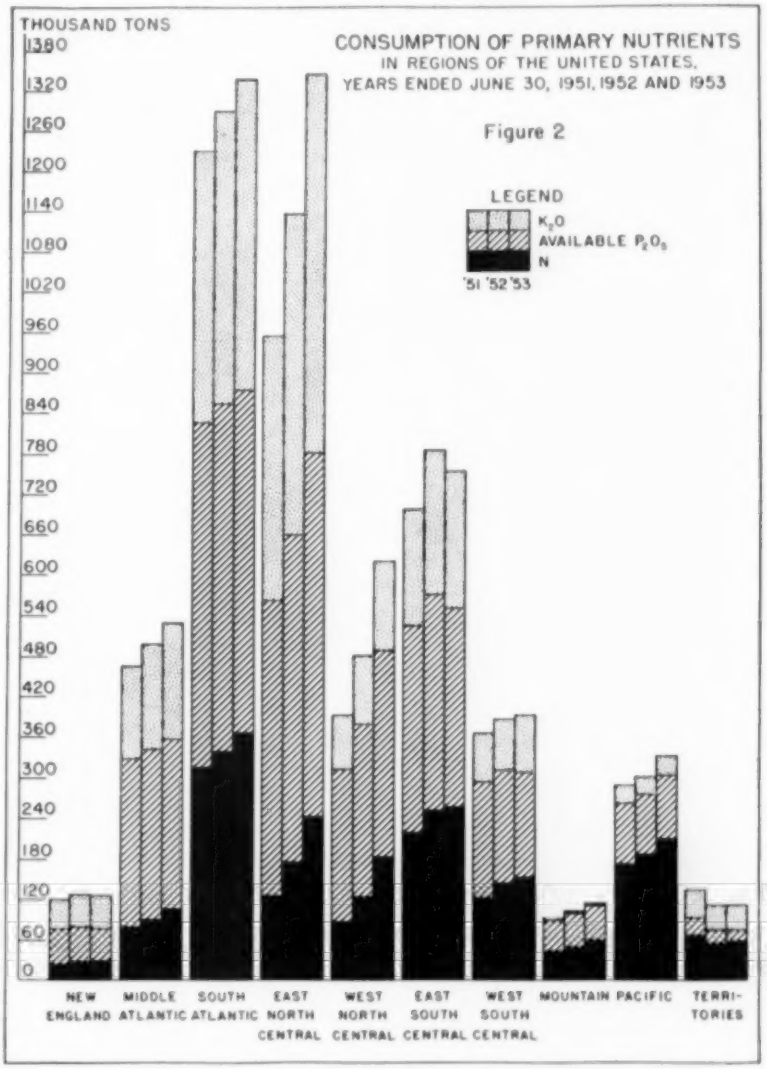
5-10-10, 5-10-5, and 3-9-6, in the order named. The total tonnage of these grades amounted to 4,905,332 tons and accounted for nearly 32 per cent of the total mixtures consumed in continental U.S. Only the 5-10-10 grade was consumed in larger tonnage in 1952-53 than for 1951-52. The tonnages of the other three were less than their tonnages in 1951-52.

The 15 principal grades consumed in each region during the current year are listed in Table 3, with their consumption in each of the respective states of the region. The total tonnage of these 15 grades represents 59 per cent or more of the consumption of mixed goods in each of the regions. With the exception of California and Florida, the number of grades reported by their guaranteed analysis for each State averaged 57. California reported 317 grades and Florida, 744.

The principal class of mixture customarily consumed in largest tonnage in the United States is the so-called complete mixture, N-P-K. Nearly 90 per cent of the tonnage of all mixtures was of this class. While for P-K, N-P, and N-K mixtures, consumption was approximately seven, two, and one per cent of the total tonnage, respectively. The consumption of each of these classes in regions of United States is shown in Table 5. The N-P-K mixtures were consumed in largest tonnage in all regions excepting the Mountain region, where N-P mixtures are favored.

The national weighted average primary nutrient content of mixed fertilizers increased from 24.86 per cent in 1951-52 to 25.85 per cent in 1952-53. This average, in 1952-53, comprised nitrogen, 4.63; available P_2O_5, 11.34; and K_2O, 9.88 per cent. The percentage of these nutrients in 1951-52 were 4.30, 11.14, and 9.42, respectively. In the current year, the average N, P_2O_5, K_2O content of mixtures increased 7.7, 1.8, and 4.9 per cent over the corresponding figures for 1951-52. The average nutrient content of all mixtures consumed in each state is shown in Table 7. Although





the national average of mixtures shows a general trend upward in all nutrients, the average N content of mixtures consumed in Arizona, Idaho, Utah, and Puerto Rico was lower. In 21 states, Hawaii, and Puerto Rico, the concentration of available P_2O_5 was below that of 1951-52 while for 11 states and the territories the concentration of K_2O was lower. States in which the concentration of nitrogen was lower were all located in the Mountain region while 13 of the 21 states using mixtures averaging less P_2O_5 were east of the Mississippi and those averaging less K_2O were mostly located in the Western half of the United States.

Materials

THE national consumption of unmixed materials amounted to 7,690,384 tons in 1952-53. This quantity represents an increase of 344,315 tons or 4.7 per cent more than the 7,346,069 tons consumed in 1951-52. The total quantity of materials consumed in 1952-53 comprised 2,987,299 tons of chemical nitrogen materials, 359,037 tons of natural organics, 3,109,635 tons of phosphates including the ammonium phosphates, 356,926 tons of potassium materials including the potassium nitrate and potassium-sodium nitrate salts, and 877,487 tons of secondary and trace element materials. The consumption of these classes is shown, by states and regions, in Tables 4 and 5.

The principal changes in the national consumption from 1951-52 in chemical nitrogen materials were the increases in ammonium nitrate-limestone mixtures, 162,328 tons (63.0 per cent); anhydrous ammonia, 48,909 tons (29.1 per cent); and calcium cyanamide, 39,965 tons (94.6 per cent). Sodium nitrate decreased 34,278 tons (5.0 per cent). Of the phosphate materials, basic slag decreased 90,237 tons (23.0 per cent) and normal superphosphates, 177,463 tons (14.5 per cent) while the ammonium phosphates increased 30,911 tons (13.2 per cent) and triple superphosphates, 23,791 tons (10.6 per cent). In potassium ma-

(*Turn to Page* 143)

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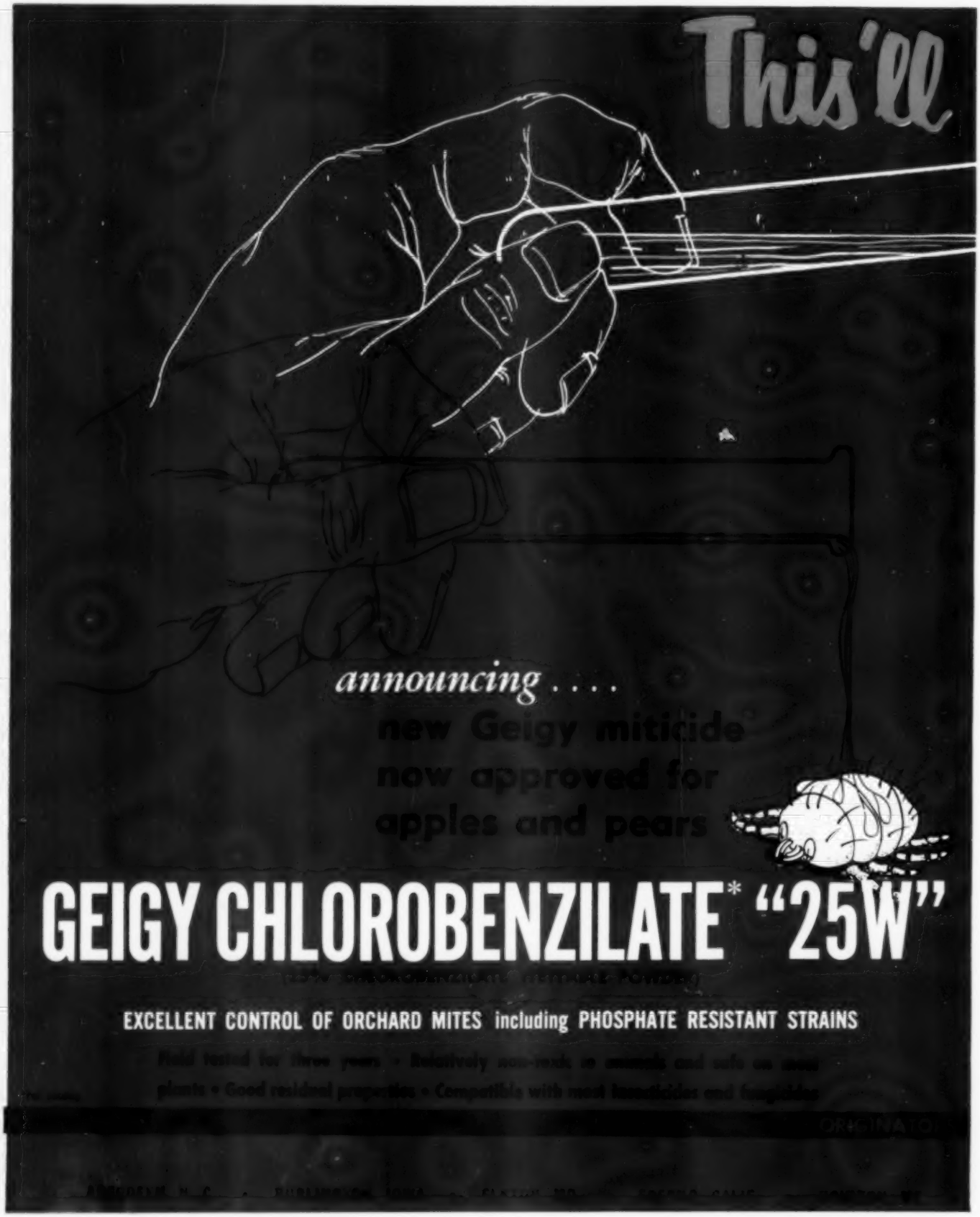


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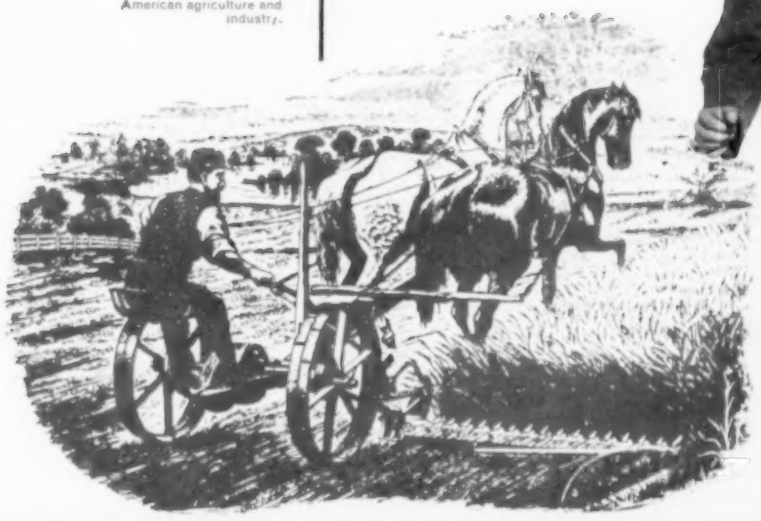
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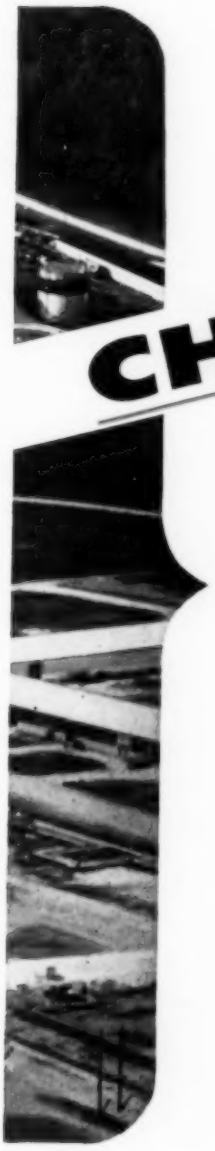
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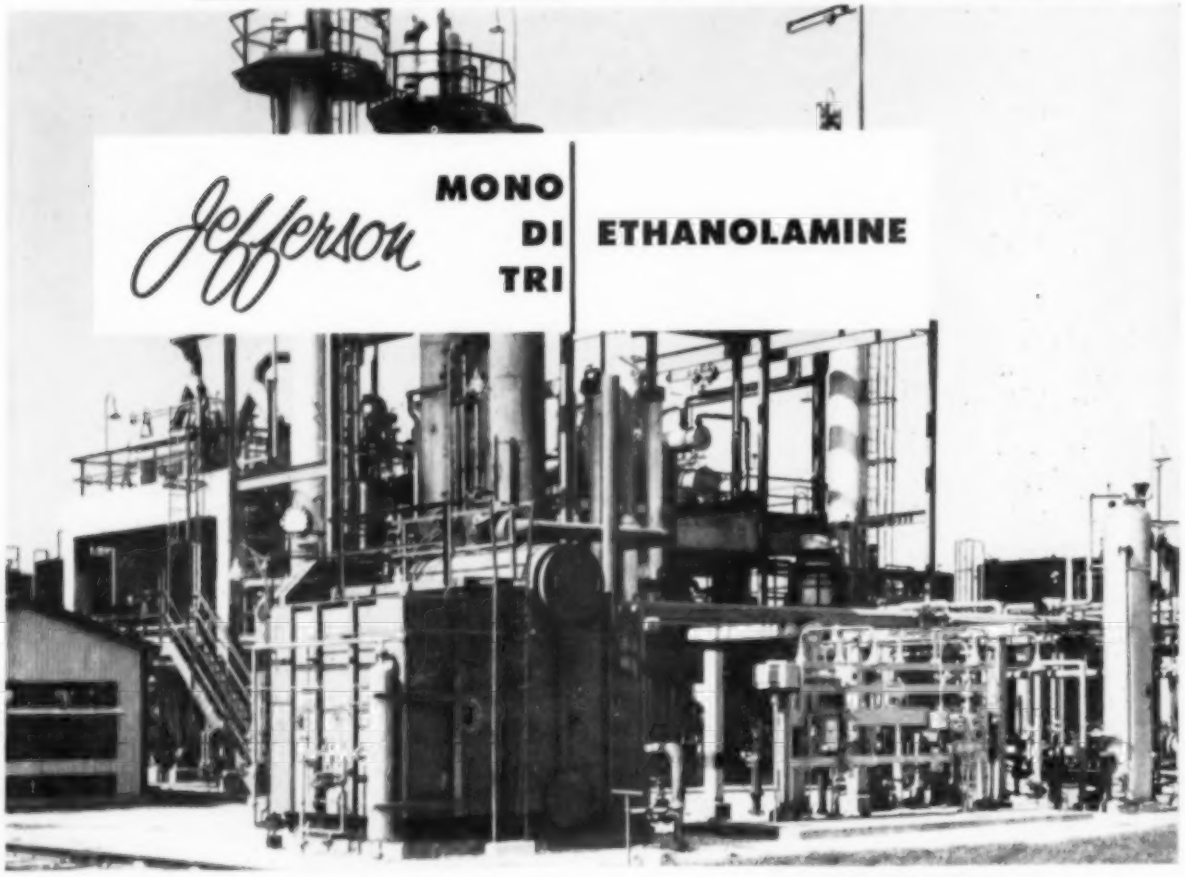
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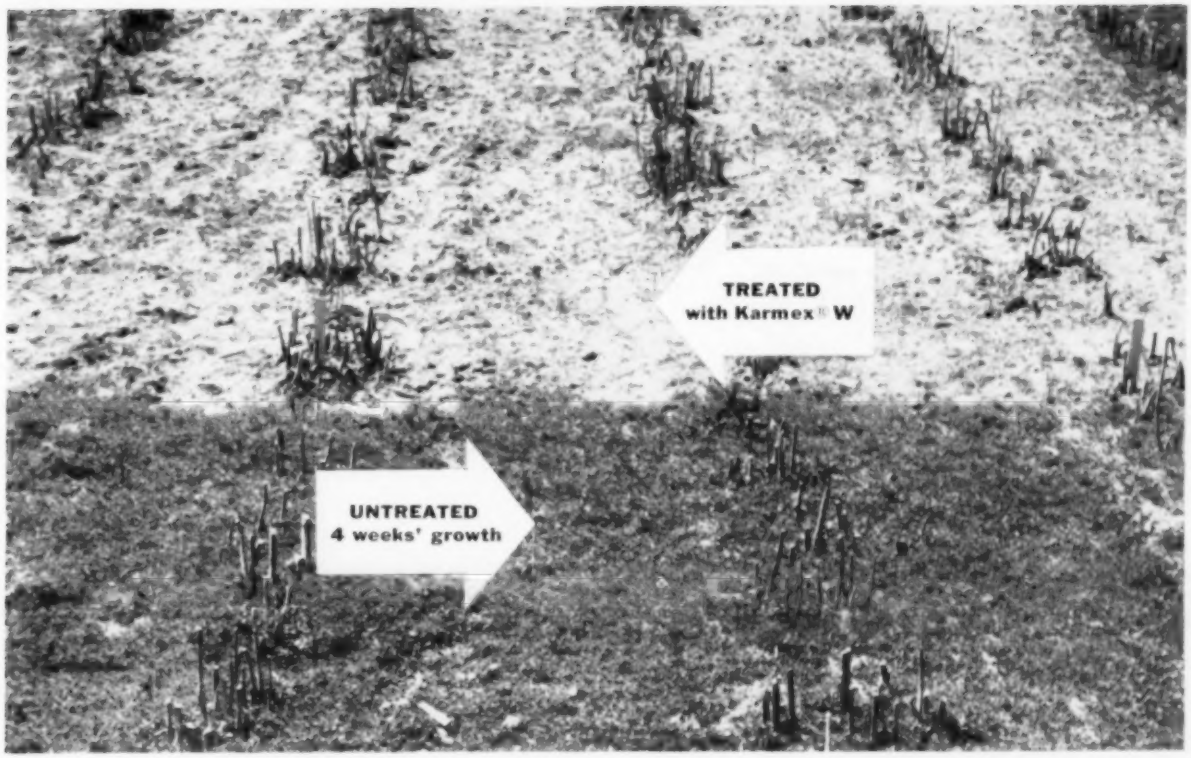


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This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.



By Paul R. Miller

PETER A. Ark and W. S. Sibray, of the University of California and the Alameda County Department of Agriculture, respectively, report that damping-off fungi, such as *Rhizoctonia solani* and *Pythium ultimum*, cause considerable damage to various nursery ornamentals when the plants are in the early seedling stages. These fungi are frequently present in various soil mixtures used in nursery practice. The trouble is especially severe where large amounts of leaf mold or peat are used as constituents. Although sterilization by steam or chloropicrin is helpful, these treatments render the soil unfit for immediate use because of temporary toxicity due to the alteration of organic constituents or slow dissipation of the gaseous sterilizing agent. In some instances, steam- and gas-sterilized soils become recontaminated by damping-off fungi which, because microbial competition has been destroyed in sterilization, may cause quite serious losses.

"Panogen" (methyl-mercury-dicyan-diamide) is one of the most active organic mercury compounds coming into use as a seed disinfectant. It is being used against *Ustilago hordei*, *Helminthosporium gramineum*, *Tilletia tritici*, *T. foetida*, *Sphacelotheca sorghi*, and many other fungi. Laboratory tests at the University of California showed its high toxicity against *Rhizoctonia solani*, *Pythium ultimum*, *Fusarium solani* f. *cucurbitae*, *Verticillium alboatrum*, *Botrytis cinerea*, and *Phytophthora cactorum*.

A great deal of the toxicity to pathogenic organisms is due to the volatility of Panogen. To demonstrate this property, a suspension of the test organism was spread over potato-dextrose agar plates, the excess removed and the plates uncovered, inverted, and dried for 25 minutes at 37° C. Discs of filter paper (13 mm in diameter) were soaked in various concentrations of the Panogen and placed on the under surface of the petri dish covers. The inoculated surfaces of the agar were placed over the discs and the plates sealed with plasticine. The plates were incubated at 28° C. The fungus did not grow in a circular area on the inoculated surface directly above the paper discs. Aeration of discs prepared by this method showed the chemical to be active even after two weeks' exposure to the open air, thus demonstrating a very slow vaporization. This behavior suggested the possible usefulness of Panogen in combating damping-off in nursery soils high in leaf mold content.

Ground leaf mold known to cause considerable mortality in many species of greenhouse plants was obtained from one of the nurseries in the East Bay area of Alameda County, California. The leaf mold was placed in new sterilized pots provided with sterilized saucers. One set of six pots was drenched with Panogen 1:10,000, and another set of six pots was treated with distilled water. After 24 hours the pots were heavily seeded with *Alyssum saxatile*, which is especially susceptible to damping-off. Complete protection of the plants was obtained with the Panogen drench, whereas mortality in the untreated check was high. At the end of the experiment only a few plants remained in the untreated sets, whereas the treated plots produced a normal quota of plants and were free from disease. *Pythium ultimum* was recovered from affected check plants.

A nursery was selected where frequent occurrence of damp-off of numerous species of bedding plants had been observed in the flats. It was a general practice in this nursery to use almost pure ground leaf mold for seeding purposes. Considerable damping-off was in evidence in a large number of flats grown in the lathhouse during the cold months of the year. The flats of leaf mold were drenched with 1:10,000. Twenty-four hours after the treatment, seeds were planted. Even the most susceptible species of plants showed remarkable freedom from damping-off fungi, both *Rhizoctonia solani* and *Pythium ultimum*. Results were so encouraging that the grower substituted Panogen drench for conventional methods of soil sterilization. No evidence of direct or residual toxicity to the plants was seen. Seedlings showed considerable vigor and no injurious after-effects could be detected at any time from the planting of the seeds to the eventual sale of the plants.

To summarize, Panogen showed considerable toxicity to damping-off fungi such as *Rhizoctonia solani* and *Pythium ultimum*. Owing to its slow volatility its action is prolonged. It produces no toxic effects on either seeds or plants in soil drenched with

1:10,000 solution. Treated flats can be seeded 24 hours after the treatment. Many common species of ornamental and vegetable plants were free of damping-off when planted in a leaf mold mixture treated with Panogen.

Captan Controls Gray Mold Rot

ACCORDING to D. Powell, experiments at the University of Illinois have demonstrated that certain fungicides will greatly decrease infections of strawberry by the gray mold rot fungus *(Botrytis cinerea)*. Experiments have been conducted primarily with small replicated plots. Obviously spores of the fungus would be disseminated from the untreated plots over the entire bed during the first and second picking, thus reducing the apparent effectiveness of the fungicide treatments. In 1953, a rather large patch of approximately two acres was treated, with three unsprayed rows on each side as checks. Control obtained could be measured more accurately by this arrangement.

A three-year-old planting of Blakemore strawberries arranged in 16 rows 1500 feet long was selected for this test. The center 10 rows were sprayed with 50% "Captan" (N-trichloromethylthio tetrahydrophthalimide) at a concentration of 8 pounds in 100 gallons of water. Three rows on each side were not sprayed. The fungicide was applied with a five-nozzle boom attached horizontally to the rear of a sprayer equipped with a 150-gallon tank and a 7-gallon-per-minute hydraulic pump set at 200 pounds pressure. The nozzles, each with a 3/64-inch disc aperture, were 10 inches apart on the 40-inch boom so that the width of one row (42 inches) could be covered with one trip through the patch. Driving speed was regulated so as to apply 5 to 7 pounds of 50% Captan per acre. Insecticides were omitted to obtain better evaluation of the fungicide treatment.

Five applications were made during the preharvest period, as follows: April 14, and April 28, early bloom; May 6, full bloom; May 12, first

(*Turn to Page* 136)

Corn Borers and Grasshoppers Increase, Fruit Fly in California

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.



By Kelvin Dorward

Cotton Insect Activity

BOLL weevils were appearing in cotton fields as far north as Florence County, South Carolina, by May 6. They were being found in the field earlier and in greater numbers in the Waco, Texas area than for the past several years. Control has been necessary in some Rio Grande Valley fields. Louisiana, Mississippi and Georgia have also reported weevil activity this spring. In contrast to this situation, survival counts from McNairy County, Tennessee show that very few boll weevils may be expected to emerge in that area this spring. Bloom inspection results for pink bollworm in the lower Rio Grande Valley of Texas are very encouraging. Counts show much lower initial infestation than last year. With the exception of whiteflies, which were heavier than normal and were expected to continue to buildup in Arizona, other cotton insect developments were about usual for the time of year.

Armyworms Causing Damage

THE armyworm, which in 1953 caused widespread damage, is again presenting a problem in several states. During early May control measures were necessary for this insect in Mississippi, Louisiana and Texas. By the middle of the month extensive control was underway in Tennessee with both airplanes and ground equipment being used. In central and southwestern Kentucky, the pest was as numerous as last year and causing damage to small grain and grass crops. Outbreak numbers were present in the southern third of Missouri, but weather was slowing the hatch in the central part of that State. Some control was necessary in southern Illinois and localized areas of North Carolina. By the latter part of the month small larvae had been reported from Virginia, Maryland, Delaware and Indiana, but control had not started. Iowa and Pennsylvania reported moth flights, but hatching had not begun.

Heavy Corn Borer Infestation

MOTHS of the European corn borer, which this year may cause more damage in several states than it did last year, are now beginning to emerge in various corn producing areas. In the eastern part of the United States moths and eggs were observed in Sussex County, Delaware. Moths are also out on the Maryland Eastern Shore as well as around College Park. Southern Illinois and Crawford County, Arkansas have also reported moths. A survey in 25 southern Minnesota counties showed that approximately 25 percent of the borers did not survive the winter. There are sufficient borers present to cause a heavy infestation with favorable weather conditions during the egg laying and hatching periods. The first pupation in Iowa for this season was observed in Boone County May 12 which was well ahead of 1953. A spring survey in Iowa which was conducted earlier showed a survival of 4,183 live borers per acre as compared to 1,759 in 1953. This indicates that a very heavy infestation may occur again in Iowa providing weather factors are favorable. Kansas pupa-

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tion ranged from 35 to 50 percent in the northeastern counties. In southeastern South Dakota counties overwintering survival was about 80 percent.

Grasshopper Hatching Underway

APPARENTLY also on the build-up this year, grasshoppers were beginning to hatch in widely scattered areas this past month. The largest area in Idaho, comprising approximately 232,000 acres in Lincoln, Mindoka and Gooding Counties was showing some hatch May 5. Hatching was well underway in local areas of Utah and light populations were appearing in Bernalillo County, New Mexico May 8. In Arizona, nymphs were found in Yuma Mesa alfalfa fields. In Denton, Fannin and Kaufman Counties, Texas, local infestations were appearing. Counts ranging from 10-20 nymphs per square yard were observed in some of the more heavily infested fields of eastern Kansas counties. In field margins of central and southwest Missouri areas, counts were up to 45-55 nymphs per square yard. Hatching had begun in western Iowa and in limited areas of Richland County, Wisconsin.

Tobacco Insect Problems

TOBACCO budworms were causing concern in Florida, Georgia and South Carolina early in the month. In the Quincy area of Florida, populations appeared earlier and heavier than usual, and caused up to 10 percent damage in some improperly treated shade-grown tobacco. Georgia had an unusually severe infestation in the Tifton area with at least 90 percent of the tobacco plants infested. The budworms appeared at Florence, South Carolina, on tobacco in the field earlier than usual and by May 8 could be found throughout the State. Tobacco wireworm was also troublesome to tobacco growers in the Carolinas. Replanting was necessary in a number of fields in South Carolina, while North Carolina had considerable damage to newly-set plants throughout the eastern area. Cutworms were numerous in some untreated tobacco seed beds in Connecticut and caused extensive damage to transplants in Pitt, Beaufort and Pamlico Counties of North Carolina. Damage to tobacco plant beds was also reported from Maryland.

Truck Crop Insect Conditions

CUTWORMS were one of the most widespread insect problems of vegetable growers during May. Damage to almost all garden crops was reported from southern Missouri. In the extreme southeast area of this State heavy damage occurred to watermelons and cantaloupes. Shelby County, Texas, had the heaviest infestation in years, while the pests were unusually abundant and caused severe damage to vegetables in the Clarksville area of Tennessee. Large numbers were reported also from the eastern half of this latter State. Damage to gardens occurred in some counties of Utah, and Washington had considerable damage to sugar beets and asparagus in the Yakima Valley. Beet leafhopper movement into the agricultural areas of Utah was underway during the month. Examinations showed that about 1 percent of the leafhoppers collected from the southern desert area contained the curly-top virus compared with 12 percent from northern Utah. In 1953

(*Continued on Page 133*)



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WASHINGTON *Report*

by
Donald G. Lerch

Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

YOU really couldn't expect farmers to take a cut in income without fighting back. One weapon is fertilizer. Early reports show farmers have been pouring it on in record amounts. They've "opened up" the corn planter and grain drills and increased the per acre application.

In some respects it looks as though farmers are putting all the talk, from colleges and the industry, to work. Fertilizers are one of the best farm buys, can increase production per acre, make more net profit—so "open'er up." Farmers may be planting fewer acres to corn but, I'll bet they get more per acre!

Talked to several friends in Pennsylvania who were planting corn. They are squeezing a few more rows between the barb wire fences and dumping more fertilizer into the hopper. They are opening the throttle on the tractor and pulling an extra harrow over the field to prepare the soil better. They are going to use herbicides and insecticides to protect the crop, once it's up. The government crop reporters better look out—they may get fooled!

Officially, the government says early corn prospects are good. Based on weather conditions so far and little or no reduction in acreage, there may be some further increase in supplies. Actually, first hand field reports that I've seen, point to the possibility of record supplies.

From the South comes word that despite a 15 to 20 per cent cut in acreage, cotton production may drop only 2 million bales or a little over 10 per cent. The difference would be mainly more fertilizer and pesticides.

Almost everywhere you turn, you see reports of record production prospects. This includes milk, poultry and eggs. Add to it livestock and livestock products—with beef slaughter up 4 or 5 per cent to a new record.

In terms of dollars, farm income is expected to be about the same as last year. Price supports are setting market prices. The lower prices for livestock, dairy and poultry will be offset largely by larger production, in the government's opinion.

* * *

The National Fertilizer Associations' estimate of fertilizer consumption during the calendar year 1953 shows it to be the highest in history. John Gale, NFA economist says the total was 20,236,723 tons. This would be 160,000 tons above the year before.

This estimate carries forward beyond government estimates to date which cover the final year up through June 13, 1953.

Both reports however show the midwest to be the big area of promise. Consumption in this section is building very rapidly. What's more, in contrast to the price cutting problem in the South, the midwest shows signs of a more stable business basis. If so, it's a rich area for future operations.

Production of grains will be far in excess of what we can use at home or sell abroad. The surplus will be dumped on the government where it will be held in either commercial or public storage. It's estimated privately, that CCC holdings will be boosted between 1 and 2 billion dollars. Even foreign sales at bargain rates aren't being counted on to reduce U. S. dollars invested in surpluses. The pile is too big.

With storage stocks of grain mounting fast, millers and the general grain trade are wondering how the new government sanitation program will affect them when it becomes effective. One of the inside battles which has been delaying announcement is whether to rely mainly on enforcement or education to make the program effective.

Some cleanup of grain storage is needed, in the opinion of most interests concerned. The 17 man committee appointed by Secretaries Benson and Hobby made its report in March. The continued delay in public announcement probably means that the effective date will not apply to 1954 production.

The problem has to be faced, however. The way farmers are producing, leads to the speculation that grain storage, including sanitation may be one of the biggest farm problems we have. Major losses due to neglect would hurt wherever they strike.

* * *

An imported insect pest is further complicating the grain storage problem. First reported in "The Listening Post," December 1953 issue, the commonly called Khapra beetle is continuing to spread. A survey, now underway, will show the new areas of infestation.

At present California and Arizona are known to be infested with the pest. Unlike the weevil, which eats part of the grain, the Khapra beetle eats the whole thing. It is potentially one of the most destructive pests we have, says the USDA.

It is under serious examination by the Western Plant Board, which is mounting an investigation and attack against this pest. Several insecticides effectively control the Khapra beetle, but some aspects of the control problem have yet to be settled.

As if with malice, the pest is a native of S. E. Asia, where we are having trouble enough. It is widely distributed throughout tropical areas and Europe.

There is always plenty of suspense when you are following a bill through Congress. Old hands at the art of legislative activity never cele-



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brate until the Presidential seal is stamped on the document.

The so called Miller Bill (H.R. 7125) and its companion (S. 2860) are but an eyelash away from White House signature. All seems prepared. Favorable action in the House paves the way for passage by the Labor and Public Welfare Committee of the Senate. Then quick action in joint House and Senate Committee Conference takes the measure one step closer to become law.

It all sounds so simple—and it is—after all the arguments have been heard, and the word is out to pass it. But, many a slip has occurred before — so keep watching.

The experienced handling of the measure by Senator Aiken, (R. Vermont) Chairman of the Senate Agriculture Committee, is a strong point in its favor. Some day when the thermometer nears the top of the bulb, it and many other measures probably will sail through.

* * *

A step-up in residue studies of forage crops may be coming. If it does, most of the work will be centered in the southeastern region of the U. S. It is likely, the study would also include cereal crops.

Some USDA officials have felt for some time that more data is needed on the total amount of pesticide residues which are apt to be present in the food supply. This includes information on fresh and processed fruits and vegetables, meats, and other animal foods such as dairy products.

During the Delaney Committee Hearings of the last session of Congress, the matter of total residue hazard was touched on, but not pursued since the investigation was supposedly confined to fruits and vegetables. Nonetheless, the question has been raised — it is there.

Industry research is doing much to meet it. The wealth of data on the toxicology of pesticides, detailed information on recommended usage, and numerous laws, provide strong protection.

As a matter of fact, the real problem brought about by pesticides is the increase in world population resulting from the destruction of disease carrying insects. There are millions of tons of food crops available today because of the use of pesticides, with a correspondingly high population, that it seems odd to pay so much attention to the problem of safety from residues. Yet, the standards of perfection demanded by all of us as citizens spurs the scientist to build even greater margins of safety.

The USDA's look into the residue situation in the southeast could provide additional data for the benefit of all. Final determination will be made after the comptrollers go over the budgets which Congress passes. If they find the extra $175,000, as recommended by the House, the study will probably begin before fall.

* * *

In Washington, you often hear bureau chiefs kidding about hats—and they aren't thinking about their wives or secretaries. They are referring to the constant change of titles that is about as dependable as the tide. Industry men sometimes get hit with the same disorder, but not quite as often.

(Continued on Page 134)



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Technical
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Automatic Titrator for Insecticide Residues

WITH the widespread use of new and more potent organic pesticides there is increasing interest on the part of growers government agencies and food processors in spray residues, pesticide ingestion by animals and tolerance amounts in food products. To determine these spray residues quantitatively requires highly refined and precise analytical procedures, since it is frequently necessary to analyze samples containing less than 0.1 part per million of the pesticide in question.

Many pesticides of particular interest contain chlorine or other halides. Halogen-containing pesticides include the following: Aldrin, Dieldrin, Isodrin, Endrin, DDT and analogs, Lindane, Aramite, Ovotran and Sulphenone.

Determination of chlorine content of residues has been used in the past as a measure of the amount of pesticide present. The usual chlorine methods heretofore used have been considered unreliable because of the variable amounts of fatty acids liberated by the rigorous saponification step used to liberate organically bound chlorine from plant extracts containing pesticide residues. Although most of these acids could be subsequently precipitated and removed, some would frequently remain and cause interference by co-precipitating during the chloride determination while the sample is titrated with $AgNO_3$. Oily and waxy fruits such as citrus and avocados are particularly troublesome in this respect. Previous methods were also complicated by the presence of large amounts of inorganic salts.

In the course of a study involving Dieldrin spray residues, the University of California, Citrus Experiment Station, Riverside, California found the need for developing a more reliable analytical method which could be used quickly and routinely on many hundreds of samples of spray residues. In the course of this particular study the laboratory ran 24-hour shift for several months and analyzed approximately 500 samples of Dieldrin spray residues. In one year the station has found it necessary to make more than 1000 analyses of various types of spray residue.

To obtain improved speed and reliability of results in determining halogen containing spray residues the Citrus Station adapted an improved analytical technique in which the Beckman Model K Automatic Titrator is used.

This method appears to be reliable for measuring as little as 3 micrograms of organic chloride per sample when interferences are not encountered. With actual citrus extractives however, 20 micrograms of organic chloride represents the transition value because of background naturally occuring organic chlorides. This quantity (20 micrograms) in terms of sample size analyzed corresponds to 0.04 to 0.1 part per million.★★

Mn Deficiency in Soybeans

A light green mottling in the leaves of soybean plants is often the result of manganese deficiency in the soil. In severe cases and in the late stages, the patches become yellow, then brown, and die.

Manganese deficiency in soybeans may be corrected by spraying the plants with a solution of a spray grade of manganese sulfate dissolved in water. Spraying each acre of beans with a solution of five to seven pounds of manganese sulfate in 40-75 gallons of water is usually satisfactory. The spray should be applied when the bean are four to five inches tall. The addition of manganese sulfate to weed control sprays has not been tested and therefore is not recommended.

Manganese deficiency may be prevented by mixing 14 pounds of managanese sulfate with the total amount of fertilizer to be applied to each acre of soybeans. If 200 pounds of fertilizer are applied per acre, the mixture should be made up of 7 lbs. of manganese sulfate for each 100 pounds of fertilizer or a total of 14 pounds. Care should be taken to prevent the fertilizer from coming in direct contact with the seed. The use of a conventional corn planter with fertilizer attachment designed to place the fertilizer about one inch to the side of the seed is satisfactory. Analyses such as 3-12-12, 0-20-20, 4-16-8, and 0-20-10 are satisfactory for soybeans and may be used in preparing a manganese-fertilizer mixture.

Mixing the manganese sulfate with the fertilizer is important for two reasons: first, the small quantities of manganese ordinarily used are more easily applied when mixed with a large bulk of fertilizer and second, the fertilizer increases the effectiveness of the manganese, thereby making a little go a long way.

Broadcast application of manganese prior to planting is not recommended since row applications appear to be more effective. The time at which the manganese is applied also has some influence on its effectiveness. For best results, applications of manganese to the soil should be made at the time of planting.

Fertilizers containing manganese sulfate tend to cake or set up more quickly than the ordinary fertilizers and should therefore be applied soon after they are purchased. H. J. Medevski and G. W. Volk, *Ohio Farm and Home Research* March, April, 1954



By-Products of Phosphate Prod.

CONCENTRATION of uranium in phosphates occurring in some deposits in Florida, Wyoming, Montana, Idaho, and Utah amounts to an approximate range of only two-tenths to four-tenths of a pound per ton of phosphate rock. However, basic research studies and development projects by the Atomic Energy Commission and the phosphate and fertilizer industry have resulted in processes centered on producing uranium concentrates as a by-product of phosphatic fertilizers and phosphate chemicals.

In a new phase of its phosphate program, the Commission contemplates the utilization of a new phosphatic raw material known as "leached zone" or "aluminum phosphate zone" which occurs in the Florida phosphate area as a weathered material, 2 ft. to 25 ft. in thickness, overlying the phosphate rock matrix. During current mining operations this "leached zone" material is cast aside as overburden waste and is considered of little economic value in view of present technology.

The P_2O_5 content of Florida leached zone material is in the range of 10-12 per cent. The material can be concentrated by a simple sand-slime separation into a minus 200-mesh slime fraction containing more than 20 percent P_2O_5. New methods being studied increase this concentration to about 30 per cent P_2O_5. High grade phosphate rock of commerce has a P_2O_5 content higher than thirty per cent. The aluminum and iron content of commercial rock is generally less than 5 per cent, whereas, these elements account for 10-20 per cent of raw leached zone material.

The development of feasible process technology to encompass all available low grade possibilities will continue. In addition to new phosphatic fertilizers there are co-product and by-product possibilities which include alumina, fluorine, uranium and other minor metal and non-metal values. Process studies include the recovery of by-product uranium from industrial sources such as:

Wet process phosphoric acid.
Phosphate chemicals from wet phosphoric acid.
Triple superphosphate fertilizers.
Nitric phosphate fertilizers.
Normal superphosphate fertilizers.
Electric furnace operations for elemental phosphorus.

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Stored Product Protection

VARIOUS spray and dust formulations containing synergized pyrethrins, ryania, or lindane were applied to twenty-five 3,000-bushel bins of shelled corn at Beattie, Kans., in the fall of 1952, as the corn was transferred from one bin to another. Monthly samples from six points in each bin were taken through December 1953, and the insect populations were determined for each. No insects were found after treatment with a pyrethrins-piperonyl butoxide-talc dust at 100 pounds, or with ryania-n-propyl isome dust at 60 pounds per 1,000 bushels.

The first formulation caused downgrading of the corn because of the inorganic base.

The insect population was held to a very low level by ryania, ryania-sulfoxide, and ryania-n-propyl isome dusts at 45 pounds or lindane-flour dusts at 60 pounds per 1,000 bushels. The ryania-sulfoxide formulation caused downgrade of the corn because of an objectionable odor.

Dusts of pyrethrins-sulfoxide-ground rice hulls and pyrethrins - piperonyl butoxide - corn cob flour at 100 pounds per 1,000 bushels and a spray containing pyrethrins-piperonyl butoxide-water applied at 10 gallons held insect populations to a relatively low level. A spray containing pyrethrins-piperonyl butoxide-carbon tetrachloride and dusts containing lindane-flour applied at 45 pounds and pyrethrins-piperonyl butoxide-corn cob flour at 75 pounds per 1,000 bushels failed to inhibit the development of dangerous insect populations.

The moisture content of corn treated with the water-base spray decreased rather than increased in the 3 weeks following application.

Ryania residues remained high after 7 months but were rather variable. Lindane residues after 3 months were only one-thirtieth to one-fortieth of the amounts applied.

A. C. Apt. USDA Bull. E 875

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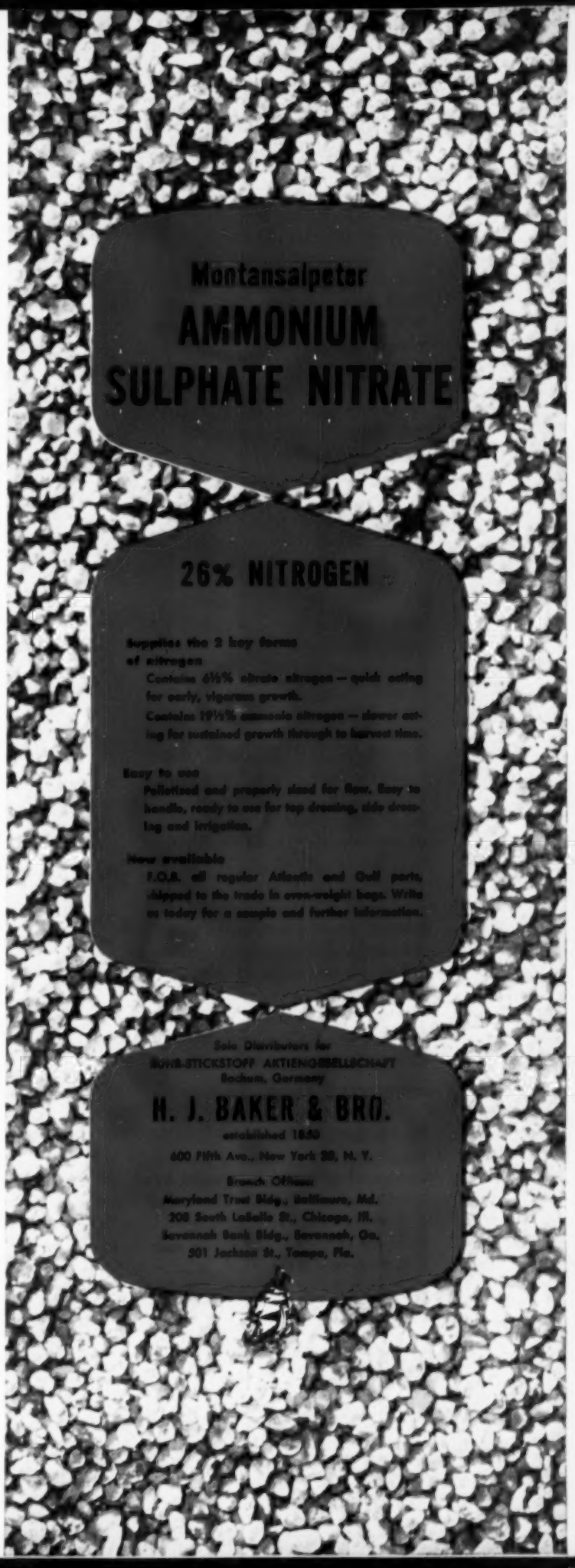
Controlling Air Pollution at a Fertilizer Plant

A DISCUSSION of air pollution and how dusts, odors and corrosive gas problems are solved at the fertilizer plant of Mathieson Chemical Corp., was reviewed by S. Cottrell, Agricultural Chemical Division, Mathieson Chemical Corp., at the Southern Industrial Wastes Conference in Houston, Texas, April 21-23, 1954.

Analysis of the dust problem showed that bag type dust filters would reduce the escape of dust to negligible proportions. A number of these units were built and installed. The recovery of dust was greater than anticipated, and the values thus recovered quickly paid for the installations. Furthermore, external corrosion of buildings and apparatus has been reduced.

In the Mathieson process, phosphate rock is acidulated, and some of the fluorine contained in the rock is released. Loss of fluorine is reduced by wet scrubber installations.

As well known, operation of a sulfuric acid plant results in some escape of sulfur dioxide. The concentration of sulfur dioxide in exit gases at the Mathieson plant was measured in tenths of a per-cent. Still complaints of an acidic odor occurred when the wind carried stack gases over residential areas. In a large sulfuric acid plant, the volume of exit gases is considerable, ranging upwards of 40,000 cubic feet per minute. To deal with this volume of gases, and to recover the relatively low percentage of acidic values, poses something of a problem. However, a two-stage ammonia scrubber, has been found to give satisfactory results. The unit converts the acidic values in the exit gases to ammonium sulfate.



Sulfur for Tomato Russet

Sulfur dust is the standard remedy for the tomato russet mite. However, recent laboratory tests indicate that a number of the new pesticides are effective also.

Good control is obtained with 2-per cent parathion, 2-per cent EPN, 5-per cent chlordane, 2.5-per cent methyl parathion, and 20-per cent toxaphene dusts. Limited tests indicate that these insecticides are also effective in sprays. However, since sulfur is effective and the other materials present greater hazards when used on tomatoes, none of them have been recommended for use against this mite.

Excellent control is obtained by dusting the plants with sulfur. Three applications are made 2 weeks apart, the first when the fruits of the main crop begin to set. A dust containing 50 per cent of finely ground (325 mesh) dusting sulfur is used at 30 pounds per acre. It may be applied in mixtures that also contain 10 per cent of either DDT or TDE for the control of the tomato fruitworm and other insects. A 25-per cent sulfur dust is effective if this schedule is followed carefully. A sulfur dust of any strength can usually be applied to transplants without injury but greater strengths may injure small plants less than 6 inches high. The tomato russet mite has also been controlled by the addition of 10 pounds of wettable sulfur per acre to sprays applied for control of other pests on tomatoes. Sulfur residues must be completely removed before the tomatoes are canned. J. Wilcox and A. F. Howland, USDA Bull. E 876.

•

Hargreaves Potash Process

The Potash Co. of America, Carlsbad, N. M., has recently applied the Hargreaves process for the production of potassium sulfate and hydrochloric acid directly from sulfur and potassium chloride. It is believed to be the first application of the Hargreaves process in the potash industry. The process uses raw sulfur, rather than sulfuric acid. Conversion and recovery efficiencies normally exceed 95 per cent, and the process is readily adaptable to large tonnage production.

It is reported that consumer acceptance of the granular acid-free sulfate has been good; and the hydrochloric acid output is generally of higher quality than that produced by the Mannheim process in making the same conversion.

•

Iron Deficiency in Crops

The necessity of trace metals, particularly iron in crops, is reviewed in a recent bulletin issued by Glyco Products Co., Brooklyn. The presence of copper in the soil prevents plants from assimilating iron present in the soil, thus interfering with normal plant growth. This may be evident where Bordeaux or other copper sprays have been applied to the soil.

Soil treatment with iron complexes of ethylene diamine tetraacetic acid, are recommended for curing iron deficiencies in crops grown in acid soils. Glyco suggests its products, iron "Tetrine" and iron "Tetrine" 6V, for citrus and other crops grown in acid soils, and its line of "Ferralkines" for use in alkaline or calcerous soils. The "Ferralkine" line is available in liquid and granular form. Both groups of products are described in a new bulletin issued by Glyco Products Co.

•

Boron Deficiency in Alfalfa

Where boron deficiencies occur, boron should be applied broadcast to the established alfalfa field at the rate of 20 to 30 pounds of a 13 per cent mixture per acre. One application will last for 2 or 3 years. Higher rates are not recommended. Rates higher than 80 pounds of borax (13 per cent boron) per acre may be injurious.

Borax may also be applied broadcast in mixture with phosphate and potash fertilizer. Mixtures of this type are prepared specifically for broadcasting on alfalfa fields and are often called "alfalfa fertilizer". This fertilizer must not be used to drill with the seed for other crops since the boron would injure germination. This type of fertilizer should not be applied at rates which would apply more than 80 pounds of borax per acre. *Boron-o-gram* NS 18, Published by Pacific Coast Borax Co., New York.

Pea Weed Control

The di-nitros, "Dow Premerge" and "Sinox P. F." have been found to be very effective in controlling most weeds in peas. These chemicals are superior to "Dow Selective" or "Sinox W" because they give good weed control with less gallonage of water, are less expensive and less injurious to peas of legume seedings.

If peas are not underseeded to hay or pasture mixes, 3 to 6 pounds (1 or 2 gallons) of P. E. or premerge should be applied in 25 gallons of water per acre. The 6 pound rate at planting time should be reduced gradually to 3 pounds as emergence approaches.

If hay or pasture mixes are seeded with the peas, the rates must be reduced to ¾ to 1½ pounds (1 to 2 quarts) depending on the temperature at time of spraying: 60 to 70° F., 2 qts.; 70 to 80° F., 1 qt. Sprays should not be applied at temperatures under 60° F. or over 80° F. Chemicals should not be applied until the peas and weeds form a canopy over the seeding, usually when the peas are about 3" tall and the seedling alfalfa or clover has a true leaf. Alfalfa and clover are more resistant to injury after the first true leaf appears. As the application is delayed, the weeds are more difficult to kill. *Cornell Veg. News* S. No.4

•

Antibiotics for Fire Blight

A foliar spray contg. 250 p.p.m. each of streptomycin and terramycin gave complete control of fire-blight infections of artificially inoculated apple trees in the greenhouse. Streptomycin at this concentration caused some foliage injury, but reducing the concentration to 125 p.p.m. gave 40-50% control with practically no injury. Field expts. were carried out on bearing Jonathan apple trees with concns. of 250 p.p.m. each of streptomycin, 125 p.p.m. streptomycin plus 250 p.p.m. terramycin, and 100 p.p.m. streptomycin alone, each formulation containing 1% methyl cellosolve and 1% carbowax 4000 as penetrants. Fire-blight control was complete, regardless of antibiotic

concn., where the spray schedule was initiated at either the balloon stage or at 30-50% of full bloom, and the trees remained free of blight infections throughout the remainder of the growing season. R. N. Goodman, *American Fruit Grower* 73, Noll, 7, 16-7 (1953).

•

Water Weed Control

The Fish and Wildlife Service, U. S. Dept. of Interior, suggests sodium arsenite for getting rid of certain submerged vegetation in farm ponds, fish hatchery ponds and small lakes. This method should be of special interest and practical use to many farmers who have ponds or lakes on their property.

Sodium arsenite has been used for water weed control for a number of years and has proved very economical as well as highly effective. It is said to control submerged vegetation, permit freer use of the water; and release organic matter for production of food for fish. It is also reported not to harm fish when applied as directed. Best results are obtained when treatment is made in the spring or early summer.

A special water weed control circular is offered by Chipman Chemical Co., Bound Brook, N. J., makers of "Atlas A", a sodium arsenite solution.

•

Spray for Chlorosis

Soil deficiency in the trace elements (i.e. iron, manganese, zinc, etc) results in the condition chlorosis, which is reflected in loss of green coloring matter, chlorophyll, in the leaves. The obvious cure for this condition is acidulation or reduction in pH of the soil, using such materials as sulfur, organic matter, iron sulfate, sulfuric acid, or other acidulating agent. The theoretical basis for this recommendation is that the calcium carbonate alkalinity is a contributing factor, and a reduced pH will offset this type of alkalinity.

Acidulation of an alkaline-calcerous soil is an expensive operation, and except for high priced crops is not considered practical. Spraying the leaves of deficient plants with dilute solutions of micro-nutrient element salts has proved successful in many cases, but the cure is only temporary. Examples are the citrus industry in Florida and the pineapple industry in Hawaii. Sprays have been inadequate in Arizona.

A new spray developed for chlorosis is a one per cent citric acid solution containing a trace of detergent wetting agent, as a spreader. To this base solution of one per cent iron sulfate, 5 per cent manganese sulfate, and .25 per cent zinc sulfate are added. Successful results have been found in treatment of chlorotic sorghum plants in Arizona. W. T. McGeorge, *Better Crops with Plant Food* p. 13 ff, March 1954

•

Sugar-Cane Pests in P.R.

Experiments were conducted in Colonia Juana Diaz, Puerto Rico, during the crop years 1950 and 1951 using the overhead-irrigation system as a means of applying insecticides,

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in an attempt to control the sugarcane moth-stalk borer. In previous work white grubs and some other soil insect pests of sugar cane had been successfully controlled.

Aldrin, chlordane, dieldrin, ryania, rhothane, benzene hexachloride, CPR emulsion concentrate, toxaphene, methoxychlor, Kryocide, Dilan 25 EM, heptachlor 2E emulsion concentrate, and Dr. Wolf's insecticide A were tested in two concentrations each.

The tests showed that these insecticides, when applied by this method of spraying, were completely ineffective in control of the sugar cane moth stalk borer. In many cases, the check plots showed less borer infestation than those treated with insecticides; in others, the insecticide was apparently more effective at low concentration than when used at twice that concentration.

Ineffectiveness of the insecticides might be due in part to the large amount of water used, which reduced the concentration of the chemical so much as to make it valueless in controlling the moth borer. L. F. Martorrell, and C. H. Burleigh, *Journal of Agriculture, Univ. of Puerto Rico*, pp. 38-60, 38, No. 1, 1954.

•

Antibiotic for Orchards

The antibiotic "Actispray", product of Niagara Chemical Division, Food Machinery and Chemical Corp., Middleport, N. Y., is reported to protect sour cherry trees against cherry leaf spot. The product is compounded from actidione, and is said to kill fungus even after it has been established for periods up to 96 hours.

"Actispray" is packaged in glass tubes in the form of soluble tablets. The manufacturer indicates that one tablet dissolved in 100 gallons of water makes an effective spray for use on orchards.

•

Temperature in Odor Control

The Mathieson process of manufacturing fertilizer, uses spent alkylation acid, containing certain organic residues, which produce quite a noticeable odor. While not particularly disagreeable at the plant, such odors may be classed as a nuisance in residential areas, and thus require removal in plant operation. Laboratory studies indicated that the amount of odorous material present is very small, but that the amount necessary to reach the threshold of smell is also extremely small. Activated charcoal absorbers to remove the odorous elements are impractical, in view of the large volume of gases involved (60,000 cubic feet per minute of stack gases saturated with moisture). Further investigation of the odor problem involved common oxidizing agents, catalytic oxidation, high pressure fog filters, scrubbers, and chemical masking agents.

After a great deal of work, Mathieson researchers concluded that only two courses were open. One was the use of activated charcoal absorbers, and the other was to heat the gases to a temperature of about

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1500 degrees Fahrenheit. Economic calculations showed that the latter course was the less expensive, and Mathieson is now in the process of completing a large incinerator installation, which they hope will completely destroy the offensive odors in exit gases.

•

Methyl Bromide Fumigant

A new catalogue on methyl bromide fumigant has been issued by the Agricultural Chemicals (Eston) Division of American Potash & Chemical Corp. Los Angeles. The catalogue reviews some of the new uses found for methyl bromide in recent years. At the same time, the company announced production of its new M-B-C fumigant (methyl bromide containing chloropicrin as a warning agent) for use in certain areas and in such places as flour mills, grain and rice storage and other uses.

•

Alanap for Vine Crop Weeds

Alanap (N-1, naphthyl phthalamic acid) has been found to be a promising vine crop herbicide, although the manufacturer (Naugatuck Div., U.S. Rubber Co.) had originally labeled it as a defoliant. 1953 tests at research stations emphasized that Alanap is not foolproof, and must be used with care and caution on some crops; it is not recommended for use on many of the squashes. 1954 suggestions for vine growers are as follows:

1. Use Alanap on only a small part of your acreage, unless you have had previous experience with it.
2. Do not use this chemical on squash unless you are certain the variety you grow will not be harmed. The common varieties of cucumbers, muskmelons, and watermelons are tolerant of Alanap.
3. Apply Alanap at the rate of 2 to 4 pounds per acre. Use the lower rate on light, sandy or gravelly soils.
4. The rate given is for an entire acre. If only a strip over the row is to be treated, reduce the amount of chemical proportionately. These sprays are safest and most effective if applied before the crop has emerged.
5. Do not treat more than once with this chemical.
6. If rain does not thoroughly wet the surface soil within 3 to 5 days after spraying, irrigate the crop at the rate of at least ½ inch.

R. D. Sweet, *Farm Research* 20, No. 2, p. 2, 1954.

Aramite, Ovotran Non-Toxic

Two of the newer insecticides, "Aramite", and "Ovotran" were reported to be practically non toxic in their effect on certain predatory insects in citrus orchards, according to University of California researchers. Dr. B. R. Bartlett of the Citrus Experiment Station advised that DDT, parathion, lime sulfur, TDE, EPN and sulfur were harmful to insects, which were not harmed by ovotran and aramite.



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● The Endothal-treated area produced 300 pounds of combine-run seed; the untreated area, 135 pounds. After cleaning, the treated area yielded 235 pounds of clean seed with 7.98% moisture, as compared with 105 pounds with 11.58% moisture from the untreated field. Germination of the treated seed was 88%; of the untreated seed, 82%.

● Results such as these emphasize the potential value of Endothal as a harvest aid chemical to growers. Service bulletins on the use of the product for legume and seed corn desiccation are available on request.

*Data available on request.



Write also for helpful "how to do it" literature on the use of other PENCO agricultural chemicals. Contact your nearest Pennsalt office, Agricultural Chemicals, Pennsylvania Salt Manufacturing Company of Washington, Tacoma 1, Washington; Philadelphia 7, Pennsylvania; Bryan, Texas; Montgomery, Alabama; Portland, Oregon; Los Angeles and Berkeley, California.

Pennsalt Chemicals

Endothal is the accepted generic name for 3,6-endoxohexahydrophthalic acid. The manufacture and use of endothal products are covered by one or more of the following U. S. Patents: 2,550,494; 2,576,080; 2,576,081; 2,576,083; other patents pending.

Methoxychlor for Bean Beetle

Two to four pounds of 50 per cent wettable methoxychlor per 100 gallons of spray is recommended for the control of Mexican bean beetle in eastern states in the USDA's recent bulletin on this pest. Dusts containing five to 10 per cent methoxychlor are also suggested. While several insecticides are listed as effective against the beetles, only methoxychlor and parathion among these are suggested for double-duty control when potato leafhopper is also present on beans. If parathion is used, it should not be applied to lima or dry beans within 21 days of harvest, the bulletin points out. DuPont *Agricultural News Letter* Vol. 22, No. 2, p. 40, 1954.

•

$CaCO_3$ Insecticide Diluent

Biological tests were conducted to determine the stability of insecticide dusts formulated with calcium carbonate as the diluent.

BHC and parathion dusts were tested against the cotton aphid, *Aphis gossypii* Glov., EPN, toxaphene, and heptachlor dusts against the boll weevil, *Anthonomus grandis* Boh., and DDT dusts against the cotton aphid, the mirid, *Polymerus basalis* (Reut.), and the bollworm, *Heliothis armigera* (Hbn.).

The calcium carbonate used was ground limestone that had been treated with a chemical reagent to produce a free-flowing, nonwettable powder. The dusts were held in storage in glass bottles at room temperature or in paper bags at 100 per cent relative humidity, and tested at intervals for a year or more. Dusts of the same insecticides formulated with pyrophyllite were tested for comparison.

The only evidence of breakdown or loss in effectiveness occurred sometime between 6 and 14 weeks after the BHC-calcium carbonate dust had been held in paper bags at 100 per cent relative humidity. After a slight loss, however, the mixture apparently remained stable during the rest of the 66 weeks in storage.

These tests indicate that the insecticides will remain stable when formulated in dusts with a free-flowing, nonwettable form of calcium carbonate and held under ordinary dry storage conditions for a year or more.

In dusting quality formulations prepared with the special calcium carbonate were greatly improved over regular commercial dusts when applied by ground machines and airplane.

In field tests dusts containing 20 per cent of toxaphene, and sufficient BHC to give 3 per cent of the gamma isomer plus 5 per cent of DDT formulated with this special calcium carbonate, gave just as good control of the boll weevil and the bollworm as the same toxicants, and others, prepared with commercial diluents.

•

BHC Effects on Growth

Gamma BHC did not affect the water absorption or percentage germination of barley seed at a concentration of less than 60 p.p.m., but the germination period varied with the concn. Increase in length and weight of seedlings cultured in 0.5-1.0 p.p.m. gamma BHC was stimulated. J. Shishiyama H. Horiguchi and H. Yamashina, Oyo-Kontyu 9, 30-4 (1953)

•

MH-30 for Tobacco Suckers

MH-30 is reported to stop unwanted, secondary growth in tobacco plants, improve the quality of tobacco tips, and increase yield up to 300 pounds per acre as compared with unsuckered tobacco.

The chemical will be generally available this season for use on flue-cured tobacco in Georgia and South Carolina, where it recently received Department of Agriculture registration. Growers can apply it with a knapsack sprayer or a mule-drawn sprayer.

The chemical is absorbed by the plant, and is translocated internally to growing points. There it stops further cell division, preventing the further development of new leaves, buds and suckers. Leaves already formed are unaffected. Only one spraying is needed during the season, compared to an average of three hand suckerings. An insecticide may also be mixed in with the spray, saving a trip over the field.

Literature Available

The following list reviews a series of bulletins on fertilizer, insecticide and fungicide recommendations, controls, etc. For the most part, these bulletins and reports are prepared by the various state agricultural experiment stations, and copies may be obtained by writing directly to the respective stations.

CONTROL OF FRUIT INSECTS AND DISEASES IN ORCHARDS AND HOME PLANTINGS by L. A. Stearn, J. W. Heuberger, and R. F. Stevens. Fruit spray schedules for 1954. Ext. Circ. 34, University of Delware, Newark, Del.

REPORT OF THE WORKING PARTY ON FERTILIZERS. 48 pages. Summary of discussions of the third meeting convened by the Food and Agriculture Organization of the United Nations, held September, 1953 in Bangkok, Thailand.

COTTON FERTILIZATION. Points out the benefits of fertilizer on cotton crops; recommendations for kinds of fertilizer to apply and methods of application. Leaf. 16, Californa Agric. Exp. Sta. Berkeley.

INSECT AND DISEASE CONTROL ON VEGETABLES by D. MacCreary, J. W. Heuberger and R. F. Stevens. Delaware's 1954 recommendations on insect and disease control Ext. Circ. 35. University of Delaware, Newark, Del.

2, 4-D for WEED CONTROL IN FIELD CROPS by J. D. Furrer. 9 pp. Types of 2, 4-D, rates to use in all crops, when to apply to different crops. E. C. 198, Univ. of Nebraska, Ext. Serv.

EFFECT OF ROTATIONS, FERTILIZERS, LIME & GREEN MANURE CROPS ON CROP YIELDS AND ON SOIL FERTILITY. Discusses results of various rotations and continuous crops, fertilizers, lime etc. Florida Exp. Sta. Bull. 522, Gainesville.

2,4-D for POST EMERGENCE WEED CONTROL IN THE FLORIDA EVERGLADES. Relates 2,4-D as to effect on plants, types, acid content, weeds controlled, rate of application. use in tolerant crops, damage to susceptible crops. Bull 532. Florida Exp. Sta., Gainesville.

RECOMMENDED FERTILIZERS AND NUTRITIONAL SPRAYS FOR CITRUS. Discusses fertilizer as to time, amount, elements included, and pH control. Bull. 536, Florida Exp. Sta., Gainesville.

WATERY BROWN ROT OF VEGETABLES IN ARIZONA. 10 pp. Recognition and control of this disease are described. Illustrations identify infestation. Bull. 253 Univ. of Arizona, Tucson.

RESPONSE OF NEW WHEAT VARIETIES TO FERTILIZERS IN POCKET AREA. By H. R. Lathrope. 8 pp. 25-31. *Better Crops* January, 1954.

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INDUSTRY *News*

Penn Salt Advances Siddall

Appointment of Cameron Siddall as manager of the Southern



CAMERON SIDDALL

division for Agricultural Chemicals of the Pennsylvania Salt Manufacturing Co. of Washington, was announced last month by Fred C. Shanaman, president of the firm. Sidall assumed his new responsibilities on May 1, and will locate at Bryan, Texas, headquarters for the Southern division of the firm. Siddall was formerly sales manager for agricultural chemicals in the west coast area, with offices in Tacoma, Wash.

The Southern division of the agricultural chemicals activity of the firm consists of the 11 states of Texas, Arkansas, Louisiana, Oklahoma, Mississippi, Tennessee, Alabama, Georgia, Florida, North Carolina and South Carolina.

In December of 1953, all of the agricultural chemicals sales, manufacturing, and distributing activities of the Pennsylvania Salt Manufacturing, parent company in Philadelphia, were transferred to the Pennsylvania Salt Manufacturing Co. of Washington with headquarters in Tacoma, Wash. The firm maintains sales offices in Philadelphia; Bryan, Tex.; Montgomery, Ala.; Los Angeles, Berkeley, Cailf.; and Portland, Ore. Western division agricultural chemicals headquarters still remain at Tacoma, with eastern activities continuing to operate out of Philadelphia.

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Pacific NW Fert. Conf.

The fifth annual Pacific Northwest Fertilizer Conference scheduled for July 20-22 will be held at the Fremont School Auditorium, Klamath Falls, Oregon. Included in the program are reports by J. C. Rinehart, Chicago; A. Ulrich, Univ. of California; and J. F. Reed, American Potash Institute.

Stauffer Executive Changes

The Stauffer Chemical Co. San Francisco, announced early in May the election of Christian de Guigne to the new position of chairman of the Board of Directors. Mr. de Guigne had been president for the past 8 years. Hans Stauffer, formerly executive vice president and general manager, was elected president, climaxing 34 years' service with the company. John Stauffer, vice president and secretary, with 36 years of service, has taken on the added responsibilities of chairman of the new executive committee.

R. C. Wheeler was re-elected vice president and Christian de Dampierre re-elected treasurer. James W. Kettle, formerly associated with the United States Steel Corp., Pittsburgh, was elected controller. All other officers were re-elected to the positions they formerly held.

JOHN STAUFFER HANS STAUFFER CHRISTIAN DE GUIGNE



50 Years for Naugatuck

Production of chemicals by the U. S. Rubber Co., New York, was started in 1904 with the formation of the subsidiary Naugatuck Chemical Co. The division observed its 50th anniversary with a special luncheon and press conference last month. J. E. Caskey, vice president and general manager indicated that new production facilities soon to be completed and a number of new products scheduled to move from laboratories into production will increase the sales volume of Naugatuck Chemical Co. about 25 per cent by 1956.

The expansion program is expected to add about 50,000,000 pounds of agricultural chemicals, plastics and nitrile rubber production to the division's annual capacity before the end of 1954. Naugatuck started as a small plant producing sulfuric acid. Today it makes more than 300 products. Maleic hydrazide was developed at Naugatuck, and was the first chemical capable of retarding the growth of plants. Another product from Naugatuck's laboratories is "Aramite," for control of mites on fruit trees and cotton.

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Stauffer Advances Reichard

M. Dirck Reichard has been appointed manager of agricultural sales for the northeastern territory of Stauffer Chemical Co., New York. Mr. Reichard, formerly with the agricultural chemical division of Shell Chemical Corp., New York, joined Stauffer early in 1953. He will continue to make his headquarters in Stauffer's New York office.

•

Davison President Honored

M. G. Geiger, president of Davison Chemical Corp., Baltimore, recently received the annual award of merit of the associated member division of the Research Institute of America, Inc.

•

Penn. Salt Appoints Ramstad

Pennsylvania Salt Mfg. Co. of Washington, Tacoma, Wash., announced recently the appointment of M. T. Ramstad as manager of market research.



New Microbiology Institute at Rutgers

Rutgers Dedicates Microbiology Institute

Rutgers University, New Brunswick, N. J., was to dedicate a new Institute building for the study of microbiology on June 7th, on the Rutgers' campus. Construction of the $3,050,000 building, containing equipment valued at $450,000, was started May 5, 1949. Studies of plant diseases, soil fertility, and food storage are among the phases of research planned for the institute.

Dedication ceremonies were scheduled for June 7th, to be followed by a symposium "Perspective and Horizons in Microbiology" on June 8th and 9th. President Lewis W. Jones opened the session with a dedicatory address. Guest speakers from all over the country were to present addresses and reports on microbiology at the symposium, which was also to include tours of E. R. Squibb & Sons, New Brunswick, and Merck & Co., Rahway, N.J.

Des Marais Joins Geigy

Hubert A. Des Marais has joined the industrial chemicals division of Geigy Chemical Corp., New York, and is assuming the managership of this division. Mr. Des Marais was formerly the general sales manager of Pennylvania Salt Mfg. Co. of Washington.

•

Cyanamid Scholarships

American Cyanamid Company has established an undergraduate scholarship program in chemistry and chemical engineering to supplement its existing post graduate fellowships and grants. Under the new program 17 undergraduates about to enter their junior or senior year will be awarded $600 each for the academic year 1954-55.

•

Lion Ships from New Plant

The first train-load of anhydrous ammonia was shipped May 17 from the Barton plant, Lion Oil Co.'s new chemical manufacturing installation near New Orleans. The plant, which has been under construction since mid-1952, is expected to be in full operation shortly.

Insecticide Blender in N. C.

Joe E. Michael, Jr. has just organized Mike, Inc. in Newland, N.C., for the blending and distribution of insecticides and fungicides for the Blue Ridge Mountain area of North Carolina, Tennessee and Virginia.

Mr. Michael, a graduate of North Carolina State College with a B.S. in Agricultural Chemistry, has had experience in the field with the Niagara Division of Food Machinery & Chemical Corp., Planters Chemical Corp., Norfolk, Va., Kilgore Seed Co., Plant City, Fla., and other companies in the south.

J. E. MICHAEL, JR.



New Dept. for Standard Oil

Standard Oil Co. (Indiana) has established a new specialties department and named C. J. Struble as its manager. Included in this department are home garden products, agricultural insecticides, and herbicides.

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Irvine Dow Sales Rep.

Milton B. Irvine, St. Louis, was named Dow Chemical Co. sales representative in Colorado, New Mexico, and Wyoming. Mr. Irvine has aided in developing new uses for agricultural herbicides in pre-harvest spraying of seed crops, and has contributed to weed control research work.

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Farmer-Banker Program

In a program designed to better farmer-banker understanding, Spencer Chemical Co., Kansas City, Mo., recently conducted elections for a "Distinguished Farm Banker" in each of six midwestern farm states, and held a luncheon in Kansas City on May 27th, honoring the bank leaders of these states. About 50 persons attended the meeting, at which time the bankers released a "Platform for Better Farm Banking."

In setting up a "guide" for farm bankers, the group first settled on a farm education. Under the heading, "Farm Know-How," the group declared, "We believe that bankers in farming communities should keep abreast of the rapidly changing developments in farm technology. This involves close personal contacts with the local county agent, teachers of vocational agriculture and Soil Conservation Service men, as well as the close reading of farm publications and occasional visits to the state college."

The next general recommendation made for farm bank use was the hiring of a "farm service manager." A skilled agricultural representative, they stated, not only aids the bank in its farm credit work but also can be of immeasurable assistance to the bank's customers in showing the way to a sound, scientific farming program.

Farm meetings were next recommended, as a further educational aid. Farm youth programs, to encourage young people in farming, was also a plank in the platform, and the last two points dealt with production and long-term loans.

Concerning production loans, the group stated: "Recognizing the fact that bankers can have great influence on the philosophies and methods of farm customers at the time they apply for loans, we propose that bankers make every possible effort to interest borrowers in better farming techniques and to make sure the loan granted will finance such operations."

"Distinguished Farm Bankers" honored were: John H. Crocker, president of the Citizens' National Bank, Decatur, Ill.; E. J. Evens, cashier of the Citizens Bank, Amsterdam, Mo.; Roy Sweet, president of the Story County State Bank, Story City, Ia.; D. E. Croule, vice-president of the Northwestern National Bank, Minneapolis; R. N. Downie, president of the Fidelity State Bank, Garden City, Kans., and James R. Kenner, president of the Thayer County Bank, Hebron, Nebr.

Iran Asks Fertilizer Bids

The government of Iran is soliciting bids from U. S. Suppliers for 250 tons of fertilizer, according to information forwarded by the American Embassy. Offers are sought for 100 tons of ammonium sulfate, containing 20.5 per cent nitrogen; 100 tons of ammonium phosphate, containing 45 to 52 per cent phosphate and 37 per cent nitrogen; and 50 tons of ammonium nitrate containing 20.4 per cent nitrogen.

U. S. suppliers are asked to submit bids to the Economic Department, Ministry of Foreign Affairs, Teheran, Iran, quoting cost and freight (C&F), Khorramshahr, Iran and specifying the proposed terms of sale. No deadline for entering bids was mentioned in the announcement.

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FMC Names Prutton

Carl F. Prutton has been appointed vice-president and technical director of the Chemical Divisions of Food Machinery & Chemical Corp., New York. He was formerly officer and director of several Mathieson Chemical Corp. subsidiaries.

MEETING CALENDAR

June 13—Executive Committee, Fertilizer Section, National Safety Council, White Sulphur Springs, W. Va.

June 10-13—American Plant Food Council, The Homestead, Hot Springs, Va.

June 14-16—National Fertilizer Association, Greenbrier Hotel, White Sulphur Springs, W. Va.

June 14-16 — American Society of Agronomy, summer meeting, Corn Belt Branch, Lincoln, Neb.

June 21-24 — Joint meeting, Amer. Society of Agronomy and Western Society of Soil Science, Pullman, Wash.

June 21-22—Assn. Southern Feed & Fert. Control Officials, Skirvin Hotel, Oklahoma City, Okla.

June 22-24—Soil Microbiology Conference, Purdue University, Lafayette, Ind.

June 22-24 — Pacific Slope Branch, E.S.A., Pilot Butte Inn, Bend, Ore.

June 28-29—North Central Phytopathological Meeting, Ames, Ia.

July 1-4—Plant Food Producers of Canada, Manoir Richelieu, Murray Bay, Quebec.

July 12-14 — American Society of Agronomy, Northeast branch, summer meeting, New Brunswick, N. J.

July 20-22—Pac. Northwest Regional Fert. Conf., Klamath Falls, Ore.

July 22-23 — Southwest Fertilizer Conference, Buckaneer Hotel, Galveston, Tex.

July 28-30—Eighth Annual Beltwide Cotton Mechanization Conference, Little Rock, Ark.

Aug. 10-12 — Ohio Pesticide Institute summer tour, starting at Wooster, ending in northwestern Ohio.

Aug. 11 — Annual Kentucky Fertilizer Conference, Guignol Theater, University of Kentucky, Lexington.

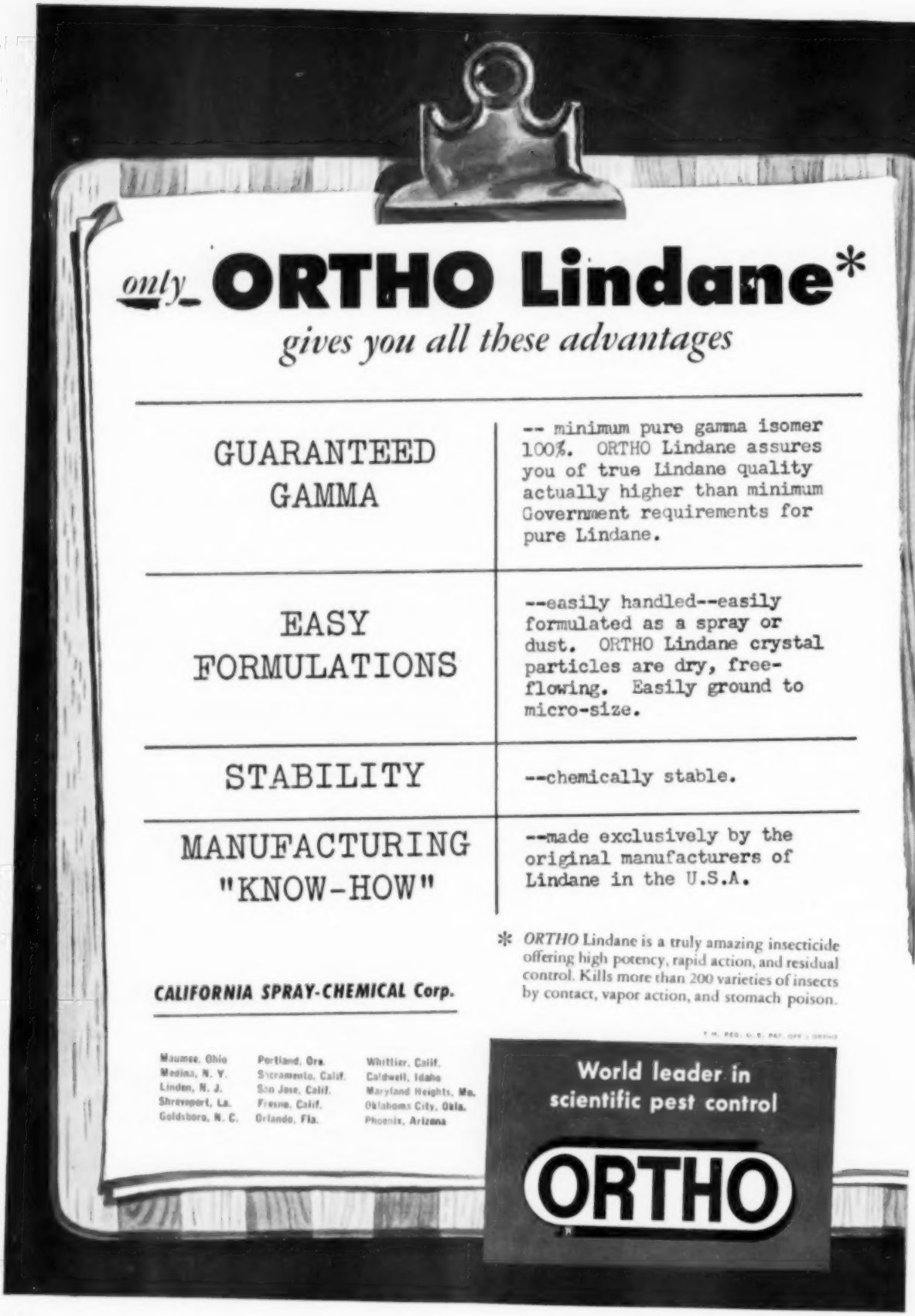
August 25-27 — American Phytopathological Society, 46th Annual Meeting, Estes Park, Colo.

Sept. 8-10 — National Agricultural Chemicals Association, Spring Lake, N. J.

Oct. 6-7—Fifth Annual Convention, Pacific Northwest Plant Food Association, Sun Valley, Ida.

Oct. 18-19—Fertilizer Section, NSC, Chicago, Ill.

Nov. 15-16—California Fertilizer Association, del Coronado Hotel, Coronado, Cal.


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Intl. Min. Opens New Plant

More than 300 farmers, fertilizer dealers and agricultural officials attended opening day ceremonies April 20th of the new International Minerals and Chemical Corp. fertilizer plant in Clarksville, Tenn. The new plant is a dry-mix operation, getting superphosphate from International's plant at Florence, Ala., and potash from International's mine and refinery at Carlsbad, New Mexico. These, together with other ingredients, are blended into complete mixed fertilizers.



J. H. Whiteside

J. H. Whiteside, formerly assistant superintendent of International Mineral's Tupelo, Miss. plant is superintendent of the new Clarksville plant, H. H. Douthit, located at Cincinnati, is manager of the area which includes the Clarksville district; and James H. Sibley is district sales manager.



Aerial view of the new fertilizer plant at Clarksville, Tenn., of International Minerals & Chemical Corporation.

Woter Soluble Warfarin

The U.S. Department of Agriculture recently registered water-soluble warfarin on silica for general use in control of rats and mice. Laboratory tests in development of the water-soluble form of warfarin were made by the Wisconsin Alumni Research Foundation, Madison, Wis. Water soluble warfarin on silica is suggested as supplementary to dry warfarin rather than as a complete replacement.

•

Issue Cotton Conf. Report

A report on cotton insect research and control, summarizing results of 1953 conferences of state and federal workers was sent early in May to registrants of the various meetings by the National Cotton Council, Memphis, who sponsor the meetings. The report compiles results of research and experience in control of cotton insects. Insecticide application, formulations, defoliation, chemical control, cotton pests, cultural practices, and insect surveys are among the subjects covered in the report.

•

O'Hara Bill Delayed

Consideration of legislation for controlling the use of chemicals in foods has been put over until next year by the house interstate and foreign commerce committee to give industry further time to reach agreement on the terms of the bill.

Rep. J. O'Hara (Minn.) who introduced the bill (H. R. 8418) early in April, explained that it had encountered considerable objection from the chemical industry, particularly as to procedures, and that a new bill is being drafted, which he will introduce when completed. He suggested that H. R. 8418 be put over until next session.

The O'Hara bill is said to represent largely the views of western food interests, and some of the procedures for enforcement are under discussion by the chemical industry.

NCFG at Santa Clara

The third annual tri-county meeting of the northern California Flower Growers, held April 27th in Santa Clara county, included discussions on soil insects and nutrition, pollution, weed control, and soil sterilization. Displays at the meeting included exhibits by Geigy Co., Food Machinery & Chem. Corp., A. L. Castle, Inc., Braun Knecht Heiman Co., and Neil McLean.

A report on air pollution and plant growth by John Middleton, University of California, Riverside, outlined the work done at the University, and described a "smog generator." Dr. Middleton indicated that 6 parts per billion of ethylene gas in the atmosphere was found to injure some plants. Susceptibility of plants to contaminants in the air was reported to vary with different strains and to increase as the temperature increased.

J. E. Swift, University of California, Berkeley, reported on soil insects and their control; and O. A. Matkins, Soils and Plant Laboratory, Orange, Calif., discussed soils and plant nutrition. Dr. Kenneth F. Baker, University of Calif., Los Angeles, presented a paper on the principles of soil sterilization; and W. Harver, University of California, Davis, discussed the herbicide "Harvacide".

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Cyanamid Official Dies

Charles M. Nesbitt, 63, Middle Atlantic district sales manager of American Cyanamid Co.'s Agricultural Chemicals Division died of a heart attack May 4th. Mr. Nesbitt joined American Cyanamid in 1936, and was named to the sales managership in 1946.

•

Joins Bollworm Program

Mississippi is the latest cotton state to join in the cooperative financing of the expanded pink bollworm research program which got underway last year. An appropriation of $50,000 for the years 1954 and 1955 was made by the Mississippi legislature late in April.

Fertilizer Manufacturers:

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can increase your peak shipping capacity

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Use *Nacconol NR Flake* or *Dense Beads* —the free-flowing, non-dusting types that disperse beautifully and uniformly. Add the required amount at the weighing hoppers or pre-mix with potash or other dry materials being used in the mixture. Distribute Nacconol throughout mix as thoroughly as possible. It's simple and easy as that! And it's inexpensive.

Nacconol is available from nearby warehouse stocks. Write, wire or phone our nearest office for price and delivery.

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San Francisco 5, Cal., 517 Howard St.	SUtter 1-7507	Chattanooga 2, Tenn., James Building	Chattanooga 6-6347
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Pacific Branch of E. S. A. To Meet at Bend, Oregon June 22-24

WESTERN entomologists will hold their annual summer meeting at Bend, Oregon on June 22, 23 and 24. This is the regular meeting of the Pacific Branch of the Entomological Society of America, and headquarters will be in the Pilot Butte Inn. Stanley B. Freeborn, University of California, Davis, is chairman of the branch. With aid of the program chairman, Paul O. Ritcher, Oregon State, Dr. Freeborn has prepared an excellent program, in which submitted papers are well balanced with panel discussions, invitational speakers, motion pictures, and social events.

One of the several panel discussions will be on the topic of the integration of laboratory and field research, with L. G. Glover, as moderator. Another panel discussion will be on the subject of soil insecticides with Dr. Harry Lange acting as moderator. This panel will explore all uses of insecticides in the soil, and especially the application of insecticides in fertilizer mixtures, and the pelleting of seeds.

This year marks the one hundredth anniversary of economic entomology and in keeping with this event, Dr. Al Boyce will present an invitational paper entitled "One hundred years of insect control by chemicals."

Much new information has been developed lately on acaricides. One of the most interesting phases of this development is the fact that each new acaricide shows the ability to kill certain species of mites, and may fail to kill certain other species. This specificity of acaricides will be the subject of an invitational paper by Dr. M. M. Barnes.

The present status of the reorganization of the Federal Bureau of Entomology and Plant Quarantine will be the subject of an invitational paper by Dr. E. F. Knipling. These, and other invitational papers and panel discussions plus an up-to-the-minute presentation of experimental



STANLEY B. FREEBORN
Chairman of the Branch

results in regular submitted papers, will make an interesting and informative session.

The annual banquet, floor show, and dance will be held in the Pilot Butte Inn. In addition, special entertainment is planned for the ladies, including trips to the Peterson Rock Gardens, the House of Metolius, and picnics at Pilot Butte, Cinder Cone, and Lava Caves.

•

Soil Microbiology Conf.

A soil microbiology conference, sponsored by the American Society of Agronomy, the Soil Science Society of America and Purdue University, will be held at Purdue University, June 22-24, 1954. Particular emphasis will be placed on soil insecticide reports at the meetings.

Comparative effects of soil conditioners and microbial activities will be discussed by W. O. Martin, Ohio State Univ., and J. P. Martin, Univ. of California. A general discussion of insecticide, fungicide and herbicide effects on microbial activities in soils will be directed by W. B. Bollen, Oregon State College. Other discussions will concern soil aggregation, micro-organisms in soil formation, physical properties of soils, organic matter transformations, etc. A tour of soils experiments at the Purdue Agricultural Experiment Station will conclude the three day session.

•

Texas Fertilizer Co. Expands

The Southwest Fertilizer and Chemical Co., El Paso, recently expanded its production facilities for fertilizers and insecticides. The new plant has manufactured approximately 20,000 tons of 20 per cent superphosphate fertilizer in addition to other grades of fertilizers, since it was completed slightly less than a year ago. Future plans call for manufacture of two more pelleted fertilizers, 15-15-0 and 10-20-0.

•

New Pfizer Sales Div.

Chas. Pfizer & Co., New York, has established a chemical and agricultural sales division for world marketing of industrial chemicals, animal food supplements and veterinary specialties. J. O. Teeter, formerly far eastern regional director, was named head of the new organization.

•

New Monsanto Laboratory

Monsanto Chemical Co.'s organic chemical division plans to install a new laboratory in its research department to use radioisotope tracer methods to study biological processes and chemical reactions. Among the phases of investigation planned is the determination of how organic insecticides and herbicides kill insects and weeds. Chemical reactions employed in the company's manufacturing plants will also be studied with the technique.

•

New Bagpak Plant in Ala.

The Bagpak Division of International Paper Co., New York, will open a new converting plant for the production of multiwall sacks in Mobile, Ala., with operations beginning about mid-July. S. D. Andrew will be plant manager, C. B. McCord, assistant plant manager and A. Morgan, superintendent.

Paper Canisters KEEP THEIR POWDER DRY!



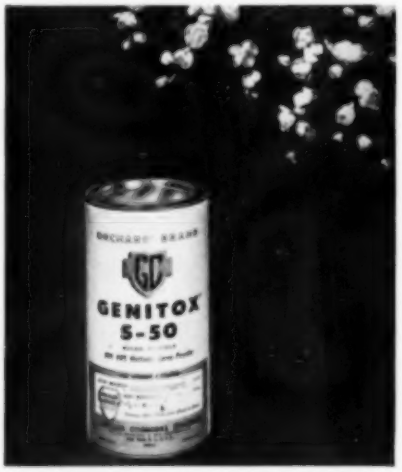
Paper gun shoots to kill garden bugs! This novel Harcord package helps boost Pratt's Garden and Rose Dust sales to an all-time high! Harcord's simple yet effective powder spray gun works easily, conveniently, because Harcord standards turn out only action-perfect packages. And Harcord's budget-wise pricing permits a fast "retail" on a sell-on-sight-package.



AMMUNITION for insect control is one of the many areas where Harcord packaging plays a big and budget-conscious job . . . because these adaptable paper canisters are so well suited to the insecticide field. Special "moisture-proof" processing helps maintain the free-flowing high potency of many powdered insect killers. Let Harcord engineering "know-how" produce the canister that will suit the precise purpose of your product . . . well within your budget!



Vivid TAT MO-GO container lures customers with its eye-catching package . . . and snug, easy-action plug closure. This competitively priced Harcord canister puts self-service appeal into a top-performing insecticide.



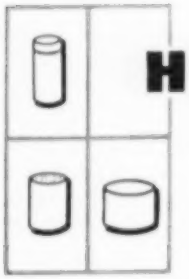
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Potash Deliveries Up in '54

A total of 1,047,320 tons of potash salts containing an equivalent of 614,362 tons of K_2O was delivered during the first quarter of 1954 by the seven major American producers, according to the American Potash Institute. This is the largest tonnage ever shipped by the American producers during any quarter and represents an increase of 17% in salts and 18% in K_2O over the corresponding period in 1953. Deliveries for agricultural purposes in the United States, Canada, Cuba, Puerto Rico, and Hawaii consisted of 1,008,661 tons of potash salts equivalent to 590,419 tons of K_2O as compared to 493,572 tons K_2O in the first three months of 1953.

Muriate of potash predominated with 558,638 tons K_2O whereas 31,147 tons were delivered as sulphate of potash and sulphate of potash-magnesia, and 634 tons as manure salts. Deliveries for chemical purposes totaled 35,726 tons of salts equivalent to 22,157 tons K_2O, a decrease of 21% in salts and K_2O under the corresponding period a year earlier. Exports to other than Institute countries amounted to 2,933 tons of potash salts containing 1,786 tons K_2O, an increase of 186% in salts and 193% in K_2O over 1953.

•

New Garden Supply Service

Formation of a new marketing research facility and other services for members of the garden supply industry plus increased regional editorial coverage has been announced by D. Murray Franklin, publisher of the *Garden Supply Merchandiser* magazine, Baltimore. Named to head the new Market Research Bureau is Norman M. Johnston, who for the past two years has been editor of the Merchandiser.

•

Illinois Sprayers Set Dates

Tentative dates for the Custom Sprayers' Training Schools, have been set as January 20-21, 1955, at the Illini Union Ballroom, University of Illinois. Suggestions for program topics should be sent to the attention of H. B. Petty, at the Illinois Natural History Survey, Urbana, Ill.



WM. J. WOODMAN

Velsicol Appoints Woodman

Velsicol Corp., Chicago, announced early in May the appointment of William J. Woodman as sales representative for the midwest area, with headquarters in Chicago. Before joining Velsicol, Mr. Woodman served as a consultant for several food processing firms in Wisconsin, and had worked on fly repellents and mosquito control at the University of Wisconsin.

•

A. A. Hoffman Dies

Albert A. Hoffman, 74, vice president of Calaveras Cement Co., New York, died May 3. Mr. Hoffman was the former state manager of the American Potash and Chemical Corp., New York.

Nitro Increases NH_3 Output

Expansion of its nitrogen plant at Hopewell, Va., to increase production of anhydrous ammonia by 50,000 tons per year was announced by Nitrogen Division, Allied Chemical & Dye Corp., New York.

Ammonia capacity of the Hopewell plant was increased last year. The new project, involving changes in equipment and installation of some new facilities, will further expand ammonia capacity, as well as capacity for converting ammonia to nitrogen solutions. The Hopewell plant produces ammonia, nitrate of soda, ammonium nitrate-limestone fertilizer and nitrogen fertilizer solutions. In addition to increased consumption in the manufacture of mixed fertilizers, the use of ammonia and nitrogen solutions for direct application has increased substantially in recent years.

•

Atlas-German Affiliate

A new German emulsifier company, Atlas-Goldschmidt, G.m.b.H., has been formed jointly by Atlas Powder Co., Wilmington, and Th. Goldschmidt, A.-G., of Essen, Germany. The new enterprise will undertake a program of product research and development, and will market surface active agents and emulsifiers throughout Europe and other parts of the world. Headquarters will be in Essen.

"Dithane" '54 Poster Boosts Potato Consumption

Potato growers and the Rohm & Haas Co., Philadelphia manufacturers of agricultural chemicals, both want to see more potatoes consumed—the growers so they will have a bigger market for their crop, the company so demand for its fungicide, "Dithane," will be increased. This 24-sheet poster is being posted this summer in selected potato-growing areas to help dealers sell more Dithane. Rohm & Haas Co. was one of the first industrial advertisers to employ the outdoor medium in support of products of this type.





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Insecticide Supply Limited

A REPORT on the pesticide situation for 1953-54 by H. H. Shepard, Commodity Stabilization Service, USDA, cautions farmers and insecticide formulators that a sudden epidemic of insect infestation might find supplies inadequate to cope with the situation, unless orders for new stocks are stepped up.

The report said that "the overall supply of insecticides, fungicides, and weed killers for domestic use in the 1954 season is fairly large, and ample capacity exists for the production of all anticipated requirements of major items. Ordering for use in the coming season has generally been slow so manufacturers of pesticidal chemicals have not been inclined to increase production as much during the months just past as in previous winters. This situation may affect distribution in case of epidemic infestations.

"Insect infestations and fungus infections are to a large extent dependent on weather conditions and other natural factors, few of which are predictable to any satisfactory degree. If serious epidemics should become widespread, large tonnages of pesticidal formulations would be needed promptly to avoid heavy losses by growers. A striking example is in the cotton belt where, with favorable rainfall in June and July, boll weevil populations might increase quickly to enormous numbers. Growers may find their sources of supply exhausted if bad outbreaks should occur. This situation would be serious where formulaors have bought only enough stocks to meet current needs."

The department indicated also that the diversion of acreage in 1954 to crops other than cotton, wheat, and corn is likely to affect pesticide consumption locally, but that weather often influences infestations much more than the proposed acreage shift, especially in the case of cotton crops. Furthermore, many growers are using more pesticides per acre on the reduced acreage allotment in an attempt to increase their rate of production.

It was also predicted that new uses for certain pesticides will absorb a significant volume of materials in 1954.

The following estimates of requirements for major insecticides for the 1953-54 season were reported by the department. Figures are given in thousands of pounds:

Benzene hexachloride[1]	8,000-11,000
Calcium arsenate	8,000-20,000
Chloro IPC	1,000-1,500
Copper sulfate[2]	100,000-125,000
2,4-D (acid basis)	26,000-28,000
DDT	60,000-80,000
Lead arsenate	16,000-30,000
Parathion	3,000-4,000
Pyrethrum (flowers)[3]	7,000-8,000
Rotenone (roots)[3]	4,000-5,000
Sulfur, ground[2]	300,000-400,000
2,4,5-T (acid basis)	4,000-5,000
Tetraethyl pyrophosphates[4]	350-500

[1] Gamma isomer basis; includes lindane.
[2] For all domestic uses, including industrial; calendar year basis.
[3] Imports; includes advanced (powdered).

■

A complete history, review, and study of entomology and entomologists has been compiled by the U.S. Agricultural Research Service, in observance of the centennial of professional entomology in the United States. A complete kit of "Insect Facts" offers photographs, graphs, and factual data for radio, television and publications.

Calif. Agr. Commissioners Meet

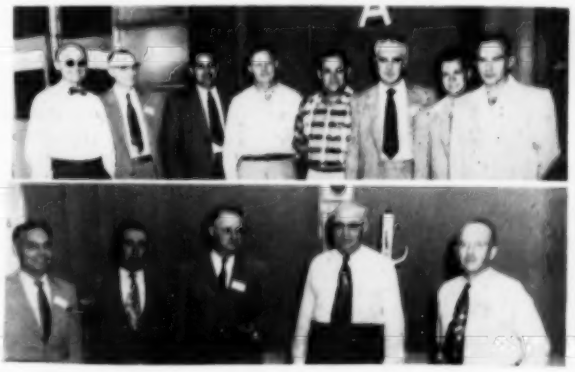
GYPSY moth control, grape diseases, the nematode situation, pest surveys, fruit fly infestations, and other problems affecting the agricultural chemical industry in California were discussed at the annual meeting of the California State Association of County Agricultural Commissioners in Modesto, Calif., on May 12-14. Acting director W. C. Jacobson, California State Dept. of Agriculture, reviewed some of the regulatory and control problems of the Department, and discussed the nature of protective and regulatory work. The duties and functions of the California State Board of Agriculture were outlined by M. M. Reiman, board member.

The current nematode situation was discussed by W. S. Hart, State Dept. of Agriculture; M. W. Allen, Univ. of California, and C. W. McBeth, Shell Laboratory. It was pointed out that mercurials are available for control work in nurseries, but there is no material currently available with sufficient vapor pressure to eliminate nematodes in soil. Dr. McBeth reported that too much moisture cuts down nematode control, and that too little moisture decreases absorption. He reviewed a method and equipment for applying methyl bromide or DD to soil.

In a report on gypsy moth control in the U. S. H. M. Armitage of the Bureau of Entomology reviewed the progress of the project to date, and presented a film prepared by the U.S.D.A. Dr. W. B. Hewitt, University of California, spoke on the history, distribution and economic importance of virus diseases. G. Stout, California State Dept. of Agriculture, also discussed grape disease problems.

A symposium on "Why You Should Buy Our Products" was presented by A. Oppedal, Braun-Knecht-Heimannn Co., Ed Littooy, Colloidal Products Corp., and S. Strew, Chipman Chemical Co.

Top photo (L. to R.), R. Underhill, Dow Chemical Co.; P. Dresher, American Paint Co., Stanley Strew, Chipman Chemical Co., B. Ball, Stauffer Chemical Co., B. Basher, Shell Oil Corp., E. Littooy, Colloidal Products Co., J. Hughes, and G. Meyer, Chipman Chemical Co.



Bottom photo (L. to R.), J. B. Steinwecker, regional coordinator of Los Angeles, R. Young, regional coordinator of Sacramento, C. H. Kinsley, regional coordinator of San Francisco, W. C. Jacobson, acting director, and C. V. Dick, State Dept. of Agriculture.

Photos by Rouland

The Most Versatile and Combination Unit



Dust fogs and fogs generated from oil or water bases have a rolling effect because they are produced at gentle low pressures. Bouncing over the terrain to the areas at which they are directed, these Microsol fogs completely envelope and surround all exposed surfaces of trees and foliage, touching everything in its wake from the ground up to the highest branches. The Microsol 403D thus gives positive control over a greater distance than any other unit known to us.

• *The Microsol is patented throughout the world.*

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403D FIELD UNIT

The Microsol 403D is new. For the first time in the field of phytopharmacie, one machine, the Microsol 403D, now offers *complete* facilities for insect control and spraying in municipalities, on farms, in orchards, or in any insect-infested area.

The Microsol 403D does the work of three different types of sprayers. In its regular form, as shown at upper right, it disperses oil solutions, dust, or a combination of both in volume and in particles of controlled micron sizes. In this form, it will disperse from 1-250 gallons of insecticide concentrate per hour in fine aerosols or heavier mists or from 1-275 lbs. an hour of dust.

Add the jet-head director to the 403D, as shown at right center, and it disperses water emulsions. With a directional fantail, lower right, it becomes a duster and granule disperser, whose particles can be directed anywhere. Both the jet-head director and the fantail are standard equipment with the 403D. Thus, by the proper use of this equipment, the Microsol 403D will successfully handle the following: 1) oil solutions, 2) water emulsions, 3) dust, 4) oil and dust, and 5) granules and weed-control products.

As a duster, the Microsol 403D does an unusual job. The aerosol dust fog is produced by a new scientific process which conditions the dust and applies the sticker-spreader uniformly, without cumbersome mixing tanks and tumblers. Output of dust can be varied from 1-275 pounds per hour.

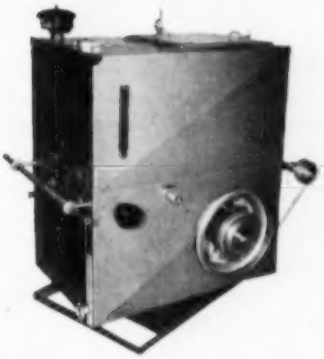
Produced by scientific research and development and proved in tests by the United States Department of Agriculture and other outstanding agencies, this newest model in the famous Microsol family of dispersing machines is compact, light (only 600 lbs.), and can be carried on a small truck (illustrated at left). Old-style mixing tanks and agitating equipment are eliminated. Only one vehicle need be tied up for all spraying and insect-control work because this new combination unit takes the place of at least three single-purpose spraying and dusting machines.

All functions of the Microsol 403D are mechanical. No boilers, compressed air tanks, combustion gas furnaces, complex controls, heat, or mixing equipment of any kind are needed.

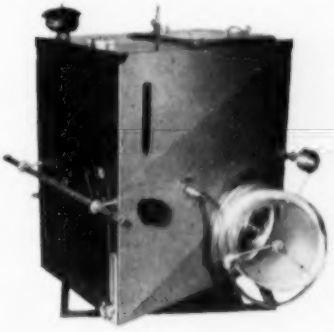
For further information and for the name of the nearest Microsol representative, kindly address inquiries to the factory.

SILVER CREEK, N. Y.

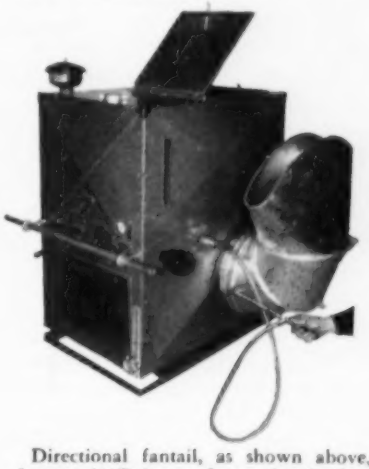
3 MACHINES IN 1



Aerosol mists are produced by the Microsol 403D in form shown above. Suitable for fly and mosquito control by adulticiding with oil solutions. Also can be used for field dusting.



Jet-head director has been added in photograph above. Now the 403D can be used for larviciding and adulticiding with water emulsions and insecticides miscible in oil. Plain or wetted dusting of row crops also is possible. Jet-head can be directed through 280°.



Directional fantail, as shown above, changes 403D into a duster that is ideal for tree and orchard work. Larviciding can be done at same time with gun jet, also shown in photograph. Fantail also can be rotated through 280°.

Protest Cut in U. S. D. A. Appropriation

REPRESENTATIVES of industry and state control agencies protested the reduced appropriations for insect control work of the U. S. Department of Agriculture for the year 1954 at hearings before the Senate Appropriations Committee held early in May. Appropriations for enforcement of the Federal Insecticide, Fungicide and Rodenticide Act were reduced from $587,600 to $510,837, while funds for the insect detection and advisory service were cut from $387,600 to $300,000.

Joseph A. Noone, speaking at the hearing as a representative of the National Agricultural Chemicals Association, opposed both reductions, pointing out that enforcement of the Federal Insecticide and Rodenticide Act assures farmers and householders that these products will be effective for the purposes for which they are sold, and if used correctly, will constitute no hazard to health or property. He further testified that "This Act serves to keep from the market ineffective or dangerous products which if used by the grower might damage his crop, fail to control the insects, weeds or diseases which attack it, pose hazards to his health and well-being, and generally constitute a public health as well as an economic problem.

"We are presently in a revolutionary period in the pest control field, new products being constantly developed and offered for sale. It is vitally important that products of this sort not be put on the market until their effectiveness and safety have been established. The Federal Insecticide, Fungicide and Rodenticide Act is intended to see that this is not done.

"We believe that it is in the interests of farmers, householders and the public generally that sufficient funds be made available for the adequate enforcement of this law. We do not attempt to propose any figure as the proper amount to be allocated for this activity. However, in view of the fact that the work load upon the agency charged with the enforcement of this Act is increasing because of the many new products being introduced, we believe that the funds for the enforcement of the Act should not be reduced from present levels."

After reviewing some of the activities of the insect survey and forecasting service, Mr. Noone reminded the committee that "for the forecasting service to best serve the growers of this country, it is necessary that an adequate number of technically trained personnel be available in various parts of the country to observe insect infestations and report them to some central point, and that there be a sufficient number of trained personnel to coordinate the information and issue accurate reports promptly for the guidance of the growers."

•

Summers Names VP-Director

Dr. C. Leroy Carpenter was recently appointed vice president and technical director of Summers Fertilizer Co., Baltimore, and its affiliate Northern Chemical Industries, Inc. The latter company is in the process of developing an anhydrous ammonia plant at Searsport, Me. Dr. Carpenter comes to Summers following two years of chemical development work with W. R. Grace & Co., New York.

•

Semel Succeeds Huckett

Maurice Semel will succeed Hugh C. Huckett, as entomologist for the Long Island Research Farm of Cornell University. Mr. Huckett will retire from this post July 1st.

•

New "Camicide" Sprays

Campbell Chemicals Inc., St. Louis, announced recently two new insect sprays available in two concentrates for farm use: One product, "Camicide #15 Pyrenone" is suggested for use around grain processing equipment, in storage areas and packing areas. It is said to control the confused flour beetle, cadelles, granary weevils and other stored product pests.

The second product is "Camicide Dairy Cattle Spray" containing piperonyl butoxide and pyrethrins for use against the tabanid fly, horse fly, stable fly, etc. This concentrate is suggested for use in automatic spray rigs.

•

New J-Manville Plant

Johns-Manville Corp., New York, has started building a new plant at Lompoc, Calif., for the manufacture of synthetic silicates from diatomite. It will produce an entirely new line of J-M products from the silicates, for use as inert absorbents, bulking agents or extenders in insecticides, fertilizers, in dry cleaning, and other fields. The new plant is expected to be in operation in about two years.

•

Southwest ACS Meets Dec. 2-4

The Dallas-Fort Worth Section of the American Chemical Society will be host to members during the 10th Southwest regional meeting to be held in Fort Worth on December 2-4. The membership includes Texas, Louisiana, Arkansas, Oklahoma and New Mexico. Papers on industrial and agricultural chemistry should be submitted to T. S. McDonald, Procter & Gamble Co., Dallas, Texas.

•

Amer. Ag. Ex-Chairman Dies

Horace Bowker, 67, retired chairman of the executive committee of the American Agricultural Chemical Co., New York, died at his home on May 25th. Mr. Bowker was chairman of the board of directors from 1934 to 1937, and then chairman of the executive committee. He retired in 1939.

From 1915 to 1935 Mr. Bowker was a director of the National Fertilizer Association, serving as president during World War I. He was a foremost authority on American agriculture, and active in promoting the use of chemicals in supplying soil deficiencies.

The Big News in Agricultural Chemicals

. . . is the increased trend to combined formulation of PESTICIDE FERTILIZER MIXTURES!

And The Latest Development In Carriers is TERRA-LITE® VERMICULITE

the amazing lightweight vehicle that turns liquid chemicals into free-flowing solids

Over the years, TERRA-LITE VERMICULITE has established itself as a superior fertilizer conditioner because of its remarkable properties for being lightweight, amazingly absorbent—and the fact that it helps prevent caking and maintain flowability.

Its use, too, as a carrier for chlordane and other chemicals for controlling soil pests and weeds is gaining wide recognition.

The citrus industry has discovered, and now widely accepts VERMICULITE as being an excellent carrier for iron chelates.

A new use of vermiculite is typified in the trend to the formulation of pesticide fertilizer mixtures—*controlling soil pests by the addition of granular insecticides to fertilizer!*

These uses are typical of the growing and significant trend to vermiculite, and today Agriculture continues to experiment and establish new uses of vermiculite as a chemical carrier.

If you have any type of agricultural chemical problem with relation to carrier-conditioners, chances are Terra-Lite vermiculite can serve you well. We will be glad, of course, to send you free samples and descriptive literature about the new free-flowing carrier-conditioner—TERRA-LITE vermiculite. Just mail coupon.

- ★ **Free-flowing even when mixed with a high percentage of chemicals.**
- ★ **Over 27,500,000 particles per pound, (28/65 mesh).**
- ★ **Blends well with mixed fertilizers.**
- ★ **Low Cost per unit of insecticide per ton of fertilizer.**
- ★ **Has remarkably low reactivity with chlorinated hydro-carbons.**
- ★ **Quick service from over 40 plants.**

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Terra-Lite®
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135 S. La Salle St., Chicago 3, Illinois

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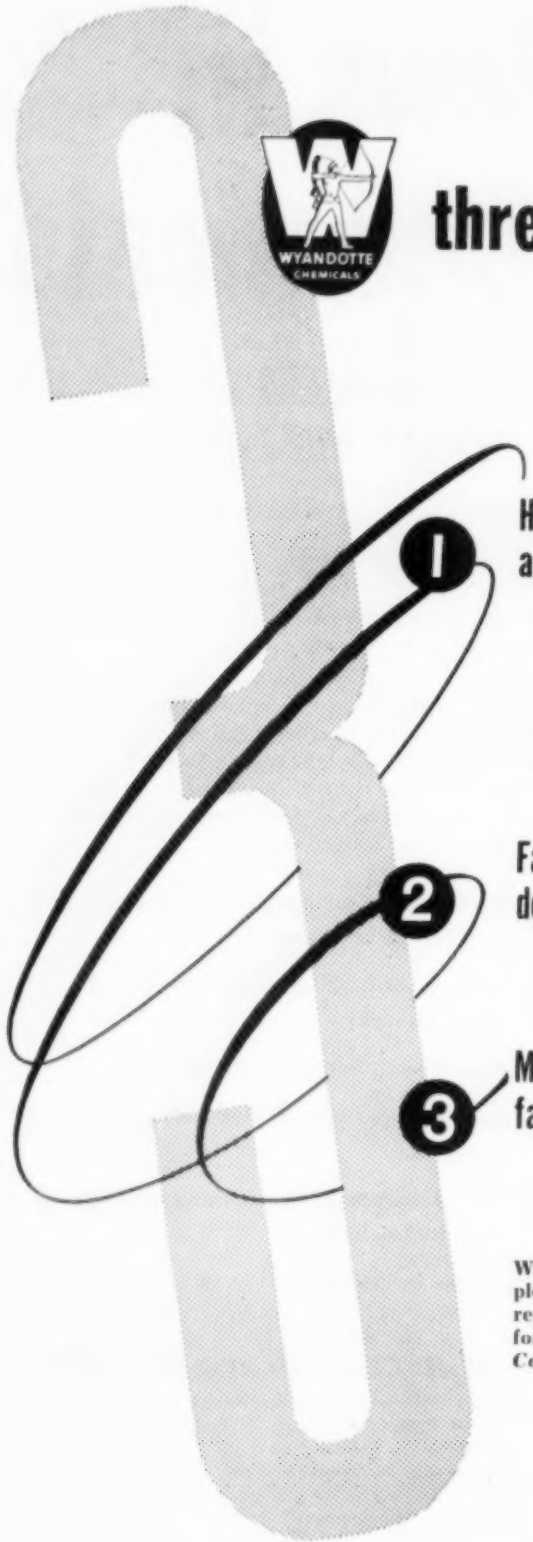
Terra-Lite, Dept. AC-64
Division Zonolite Company
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Please rush me free working sample and descriptive literature about the new free-flowing carrier, Terra-Lite VERMICULITE.

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You profit three ways when you deal with Wyandotte

1 Highest quality agricultural products

You benefit from our know-how. For we've been supplying raw-material chemicals to industry for 64 years. You'll find the Wyandotte line of basic agricultural chemicals the highest quality available anywhere.

DDT (technical) • **BHC** (technical and high gamma; gamma-content uniformity guaranteed) • **LINDANE** (free flowing, readily formulated) • **KREELON*** (alkylarylsulfonate for fertilizers) • **PLURONICS*** (surface-active agent, emulsifier) • **WETTING AGENTS** • **SOLVENTS** • **FUMIGANTS** • **EMULSIFIERS** • **SOIL CONDITIONERS**

2 Fast, dependable delivery

Often, getting your raw-material chemicals *on time* is half the battle. But there are no delivery worries when you order from Wyandotte. You receive your order for Wyandotte agricultural products promptly — in the exact quantities you need — directly from our strategically located regional plants and warehouses.

3 Modern research facilities

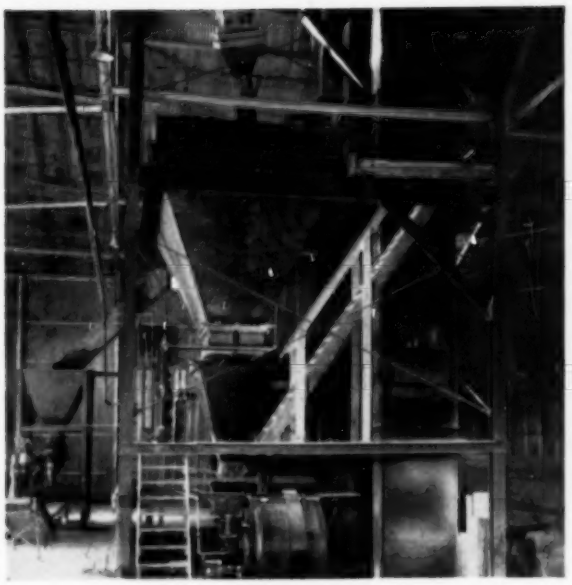
Our new research laboratories are equipped with the last word in modern testing equipment. And the experience of skilled Wyandotte service-scientists is on tap at all times to give you a hand with the improvement or development of your products — and to provide technical assistance with processing or handling problems.

We may have your answer right at our fingertips – in our complete files on the special problems of many industries . . . a representative will call at your request. Jot down your request for information, today, and mail it to: *Wyandotte Chemicals Corp., Dept. AC3, Wyandotte, Mich. Offices in principal cities.*

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SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA • CHLORINE • CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINATED SOLVENTS
GLYCOLS • SYNTHETIC DETERGENTS • AGRICULTURAL INSECTICIDES • SOIL CONDITIONERS • OTHER ORGANIC AND INORGANIC CHEMICALS



Modern fertilizer equipment and installations are included in the new fertilizer plant of Tri-State Chemical Co., at Henderson, Ky.

Tri-State Opens New Plant

Tri-State Chemical Co. dedicated a new fertilizer plant at Henderson, Ky., late in April. Complete engineering service, manufacturing equipment and construction supervision was furnished by Davidson-Kennedy Co., Atlanta. Dedication ceremonies included addresses by Ben Adams, commissioner of agriculture, Commonwealth of Kentucky; A. T. Kennedy, president of Davidson-Kennedy Co.; John W. Manning, Tri-State president; and Hecht Lackey, mayor of Henderson. Attending were more than 500 of the plant's customers, dealers, friends and members of the press and radio.

The new plant incorporates modern fertilizer machinery. "Payloaders" transport the materials to an elevator which hauls them to individual storage bins in a cluster hopper.

Batches are formulated in a weight hopper, dropped to the batch mixer and shipped to storage or to bagging. The entire plant is designed to get maximum volume with a minimum crew.

Grace Expands Urea Prod.

Grace Chemical Co. announces that its $20,000,000 plant in Memphis for production of urea will be in operation this fall. Details on crystal urea are given in a new folder issued by Grace, which presents the chemical and physical properties of this product along with industrial applications.

•

Monsanto Ala. Branch Moves

The branch sales office for Monsanto Chemical Co.'s Inorganic Chemicals Division in the southeastern states moved early in May from Birmingham, Ala., to Atlanta, Ga. G. C. Davis, who has been district sales manager of the Birmingham office, will continue as head of the Inorganic Chemicals Division's activities in the Atlanta location. J. A. Coffman, Atlanta district sales manager for the merchandising division, will continue in charge of administrative activities for this office.

•

Coop Nears Completion

The $16 million nitrogen fertilizer plant built near Lawrence, Kan., by the Consumers Cooperative Association is expected to be in production sometime in July. More than 500 member associations have signed fertilizer agreements with CCA. The program includes 14,000 investors in the new plant. Plans for future production include either nitrophosphate or ammoniated phosphate as well as straight nitrogen fertilizers.

New Borate for Fertilizer

"Colemanite", high grade, a natural lime borate, is now offered to the trade by Pacific Coast Borax, Co., New York, as a new companion source of borate featuring low solubility for borating specialty or general purpose fertilizers. Borated fertilizers may be extended and broadened by the use of Colemanite, for use on cotton and other crops such as tobacco, sweet corn, potatoes, and beans that have responded to minimum amounts of boron.

Colemanite, high grade, is recommended also for use on light sandy soils where it is desired to supply a small but continuous source of plant food boron for the entire growth season. Although low solubility of the material, extends the supply of boron for the crop season, the manufacturer advises that it does not accumulate in sandy soils from year to year.

•

Wyandotte Names Polacek

Robert J. Polacek has been named technical assistant to the manager new products—organic chemicals department in the Michigan Alkali Division of Wyandotte Chemicals Corp., Wyandotte, Mich. Mr. Polacek will help facilitate the transfer of new products from the research and development division, assisting in the introduction of new organic products.

•

Spencer Expands Ky. Plant

Spencer Chemical Co. Kansas City, Mo., recently authorized a $1,750,000 expansion program to add nitric acid facilities and a Spensol plant to the company's Henderson Works in Henderson, Ky. This expansion will add a third shipping point for the Spensol solutions being produced by Spencer at Pittsburg, Kansas, and Vicksburg, Miss.

Present plans provide for transferring the Spensol plant formerly operated at Charlestown, Ind., to Henderson. The nitric acid facilities will be entirely new. No expansion in Henderson's anhydrous ammonia production is planned at this time.



SYSTOX*

accepted for use on

POTATOES

SYSTOX has been accepted nationally for use on potatoes at an application rate of ¾ pint (3 ounces active Demeton) per acre. At this dosage SYSTOX gives long-lasting and highly effective control of potato aphid and leafhopper.

* REGISTERED TRADEMARK OF CHEMAGRO CORPORATION

CHEMAGRO CORPORATION

101 PARK AVENUE, NEW YORK 17, N. Y.

'54 Cotton Insecticide Volume to Increase

A SURVEY of the Cotton Belt area by *The Cotton Trade Journal*, Memphis, indicates that farmers anticipate increased use of fertilizers and pesticides this season in an effort to increase their per acre yield in a year of reduced acreage, and thus to keep their income up. The survey indicates how a reduction of 6,135,000 acres in cotton in 1954 will affect the manufacturer of agricultural chemicals, farm machinery and equipment, and what crops will be planted on acres lost to cotton.

The pattern of the survey appears to vary from one area to another, but more than half of the farmers queried, indicated they will either maintain or increase their dollar volume purchase of agricultural chemicals.

The fact that more cotton farmers anticipate increasing their purchase of chemicals may be attributed to the need for increasing the yield per acre in the face of the reduced allotment by the USDA of only 21,379,352 acres, compared with 25,376,000 acres planted to cotton last year. Approximately 19,240,000 acres will be planted in cotton this year. Overplanting expected in the West will be counteracted by underplanting in the East, and this, coupled with the normal abandonment of planted cotton acreage will cut the total acreage well below the allotment figure. Small grains, corn and soybeans will be the chief crops to be planted on acres lost to cotton.

Corn will predominate in the Southeast, with small grains next. Soybeans will come first in the South Central area, followed by corn. Small grains will take the bulk of the former cotton acres in the Southwest, while the rest will be divided among miscellaneous crops such as clover and feed. In the West, small grains will predominate, followed by hay and corn.

A significant part of the reduction in purchase of farm machinery, equipment and agricultural chemicals can be ascribed to the lower cash income of farmers last year as compared with 1952. In their replies, some farmers indicated this to be so, and these statements are borne out by income figures released by the USDA.

The shift in planted acreage from East to West will bring about a considerable change in the agricultural pattern of the Cotton Belt from the Carolinas to California — a change that will affect not only the economy of the cotton farmer, but also that of the cotton ginners, warehousemen, cottonseed crushers, merchants and spinners. Primarily, the acreage shift will affect the cash income of cotton farmers — and as a natural consequence, it will have its repercussions upon the industries which supply these farmers.

Replies to queries in the survey came from owners of small, medium and large farms, ranging from 20 acres in Georgia to 199,000 acres in Texas, with the bulk of the replies coming from medium-sized growers.

Co-op Urges Fertilizer Use

By H. H. Slawson

FARMERS who aren't using the amounts of fertilizer recommended by the agricultural college specialists in their respective states are missing the boat profitwise, says the management of Southern States Cooperative of Richmond, Va., in a message to members in the five-state trading area served by this big farmer supply association. If Virginia farmers used all the fertilizer the agronomists say they should, the co-op statement says, they could earn at least 73 million dollars a year more than they do. To back this up the co-op cites figures from the report of the National Soil and Research Committee's fertilizer group.

Taking corn as an example, this report says Virginia farmers during three seasons, 1950-52, used 335 lbs. of fertilizer per acre and got an average yield of 41.3 bushels of corn per acre. The college had recommended 750 lbs. of fertilizer per acre, which would have yielded an estimated average of 65 bushels per acre. For the additional fertilizer, the cost per acre would have been $11.02. Then, figuring market returns for the actual yield of 41.3 bushels and balancing this against what might have been earned from the additional yield, due to use of the recommended amount of fertilizer, the table shows that farmers could have earned $24.65 more per acre. For the state's total corn acreage, this would have amounted to the impressive sum of $23,043,000 more than was taken in for the corn raised.

On beef cattle pastures, Virginia farmers used only 70 lbs. of fertilizer per acre.

Average yield per acre was 75 lbs. of beef. For the pasture lands the college had recommended 350 lbs. of fertilizer per acre, or five times the amount actually used. This, it was figured, would have doubled the yield to 150 lbs. of beef per acre. Cost of the extra fertilizer would have been $6.50 per acre, the estimate continues. But the increased yield would have added $24,750,000 to the farmers' take.

Ag-Air Conference Report

Proceedings of the third annual Ohio-Indiana Agricultural Aviation Conference held Feb. 24-26 at the Ohio State University, Columbus, were issued recently, and are available at $2.00 from H. B. Taylor, 501 Wyandotte Bldg., Columbus, Ohio.

The 70 page report includes complete papers presented at the meetings, in four sections on entomology, agronomy, engineering, and general. Illustrations, tables and graphs presented at the meeting are reproduced.

•

Stahler Co-Author of Report

The authors of the article on "The Evaluation of Borate and Chlorate Herbicides" appearing in May *Agricultural Chemicals* (page 50 ff) were not correctly identified. Dr. L. M. Stahler and Dr. J. D. Stone of Pacific Coast Borax Co., Division of Borax Consolidated, Ltd., Los Angeles, prepared this report, and should have been credited as co-authors.

3 Pyrenone* products to prevent insect damage to stored grains and seeds



Pyrenone Grain Protectant® The farmer who feeds his corn and other grains or sells them as a cash crop knows that insects cost him money. Pyrenone Grain Protectant prevents insects from stealing his crop after it is harvested. Even though his corn is stored in open cribs it can be treated with Pyrenone Grain Protectant, and one application lasts for a normal storage season. There is no toxic hazards with Pyrenone Protectant, so treated grain can be fed to livestock without danger. It can also be ground into meal without affecting the taste or odor of baked goods. Pyrenone Grain Protectant is packed in 50 lb., 25 lb. and 10 lb. multiwall paper sacks.



Pyrenone Wheat Protectant® Wherever wheat is stored, insect damage is a major problem. Millions of dollars are lost each year to weevils and other insects. Pyrenone Wheat Protectant, applied as wheat is stored, will prevent this needless loss. One easy application lasts for a normal storage season. Treated wheat can be used for animal feed or milled into flour for human consumption because Pyrenone Wheat Protectant has no toxic hazards. Storage bins do not have to be airtight and there is no need for special masks or gloves when applying Protectant. Pyrenone Wheat Protectant is packed in 50 lb. multiwall paper sacks.



Pyrenone Large Seed Protectant (Slurry)® A special Pyrenone Protectant has been developed for use in slurry treaters. Pyrenone Large Seed Protectant (Slurry) is compatible with most fungicides, so the two can be applied to seed at the same time, if desired. Pyrenone Large Seed Protectant (Slurry) is nontoxic, so unused Pyrenone-treated seed can be used for feed purposes. (If the fungicide used is toxic, however, the treated seed cannot be sold for feed purposes.) A single slurry treatment prevents insect infestation for the normal season. Use Pyrenone Large Seed Protectant (Slurry) on seed corn or other large seeds such as oats, wheat, rye or watermelon to protect them in bulk storage from insect damages. It is packed in 25 lb. fiber drums.

For further information write: Insecticide Dept. AC, U. S. Industrial Chemicals Co. Division of National Distillers Products Corporation, 120 Broadway, New York 5, N. Y. In Canada: Natural Products Corporation, Toronto and Montreal.

Pyrenone* **PROTECTANTS**

*Reg. U. S. Pat. Off., U. S. I.



Chicago Offers Sludge

The sanitary district of Chicago is considering selling fertilizer, produced at its sewage treatment plants, directly to wholesalers, according to A. O. Olis, of the sanitary district board. He advised that the dried activated sludge can be used as fertilizer without further processing, and that the plants are expected to produce 100,000 tons of sludge in the 12 months starting July 1.

H. J. Baker & Bros. have been paying the district $16 a ton, with the current contract expiring June 30th. They have submitted no offer as of April 24th on the supply for the period beginning July 1st. Lawntex Corp., Chicago, offered $19 a ton for 15,000 tons, and Summers Fertilizer Co., Inc., Baltimore, offered $14.50 a ton for 5,000 tons.

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AIBS to Gainesville

The American Institute of Biological Sciences announces that its 1954 meeting of biological societies will be held September 5-9th at the University of Florida, Gainesville, Fla. Among the groups meeting at this time will be the American Society of Plant Physiologists, the Botanical Society of America, and the Ecological Society of America.

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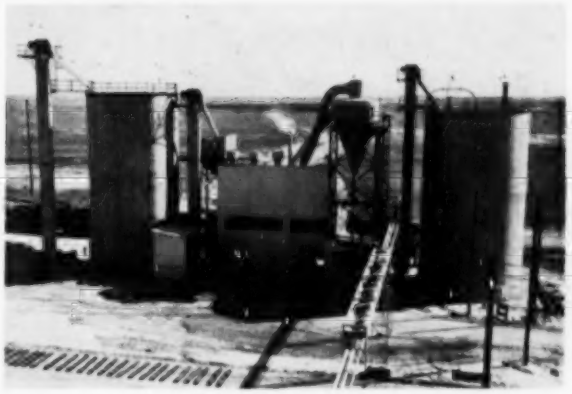
Conn. Fertilizer Report

The Commercial Fertilizers Report for 1953, for Connecticut, was issued recently by the Connecticut Agricultural Experiment Station New Haven, as Bulletin 579. The report reviews Connecticut laws and regulations regarding commercial fertilizers, classifies fertilizer materials, includes tables of analyses for potash salts, mixed fertilizers, limestone, soil conditioners, etc.

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New Development Co.

Dwyms Development Co., New York, a new service firm, recently announced its first product for commercial distribution, "Naturel", for poison ivy relief. The firm does analytical work, patent studies and licensing investigations, and manufactures special organic chemicals.



70,000 tons of dicalcium phosphate are being produced annually at the new Texas City Chemical Co. plant in Texas City, Tex.

New Texas PO4 Plant

The new $8,500,000 plant of the Texas City Chemical Co., Texas City, Texas, is now in operation, chemically producing dicalcium phosphate, an element incorporated in balanced feeds.

Dicalcium phosphate is being produced in the new plant at the rate of 70,000 tons per year, 55,000 of feed grade under the trade name "Dikal" and the remainder fertilizer grade "Texaphos". Of equal importance to the country at large, is the fact that in their process, uranium is extracted.

An integral part in the new operation is being played by Bradley & Baker, exclusive distributors of both "Dikal" and "Texaphos". Handling about 2 billion pounds of feed and fertilizer annually, with a sales volume of approximately $6,000,000, Bradley & Baker, whose main office is in New York City, has established a new district office in Houston especially to take care of the new Texas City output, which will be shipped all over the United States. C. Leonard Gemmel is in charge of that office. Other branches are located in Baltimore, Jacksonville, St. Louis, and Indianapolis.

Sale of the Dikal (feed) grade of dicalcium phosphate will be concentrated by Bradley & Baker in the feed milling centers of Buffalo, Minneapolis, St. Paul, Chicago, St. Louis, Kansas City, Ft. Worth, etc. Texaphos fertilizer grade will be sold mainly in Texas, Louisiana, Oklahoma, and New Mexico.

In fertilizers, Bradley & Baker represents, among others, U. S. Phosphoric Products Co., Bonneville, Ltd., Endicott-Johnson Corp. and Centraal Stikstof Verkoopkantoor, N. V. of Holland.

Potatoes Ineligible for Import

Special provisions in import regulations, which since 1944 have permitted potatoes to enter the United States from 8 states in Mexico, have been amended by the U. S. Department of Agriculture to declare such imports no longer eligible. This order was effective June 3, 1954.

Mainly a protective measure to prevent possible introduction of potato wart and the golden nematode into U. S. potato producing areas, the order will have little effect economically either here or in Mexico, as less than 200 pounds of potatoes have been imported from Mexico for home use by border residents in the last four years.

Fertilizer-Steel By-Product

A plant food by-product of steel production is reported to have been tried on Champaign County, Chicago, farmlands, with satisfactory results. The product, "Ag-slag", is the dross left after removing iron from the ore at the blast furnace, during the first step in steel making. On the farm it is said to take the place of limestone.

The Granulite Co., Chicago, distributes the product commercially under the trade name "Granulite Ag Slag". The manufacturer reports that the product does not cake in storage, and drills evenly. Further experiments with the product are in progress at Michigan State College.





For Trona Potash as a simple or in mixes see *your local fertilizer dealer.* He has both Trona improved Muriate and Sulphate of Potash in stock now.

PRODUCED IN THE WEST— *TO GROW THE BEST*

Farm profit can be measured in fertilizer bags. The vital plant food elements you take from the soil in growing healthy, profitable crops *must be restored.* Every bag of Trona Muriate of Potash and Trona Sulphate of Potash in your mixed fertilizer is vital in building healthy plant tissue, bolstering crop resistance to drought and disease – and makes future bumper crops possible. That's why Potash – Trona Potash, produced in the west to grow the best – is your yardstick for measuring profit on your investment. Don't gamble! Make certain your crops are receiving plenty of health-giving, profit-building Potash by including TRONA POTASH in your fertilizer program.

American Potash & Chemical Corporation

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INDUSTRIAL AND AGRICULTURAL CHEMICALS
ESTON CHEMICALS

Trade Mark APCC

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Data has been prepared on the application of Trona Potash and how it benefits important western farm crops. You'll profit by sending for this information today.

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CITY_____ STATE_____

Mathieson Plans Merger

The boards of directors of Mathieson Chemical Corp., Baltimore, and Olin Industries, Inc., New York, early in May approved motions to submit to their stockholders at special meetings on June 29th, a proposal to merge the two companies. Following the merger, John M. Olin, president of Olin Industries will become chairman of the board of the new company, and Thomas S. Nichols, current president and chairman of Mathieson, will become president of the new firm.

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Conn. Plans Field Day

The annual field day of the Connecticut Agricultural Experiment Station will be held this year on August 18 at the station's experimental farm at Mt. Carmel, according to an announcement made by J. Peter Johnson, general chairman of the event. Inspection of field plots where agricultural research is going on, a noontime discussion session, and special exhibits and demonstrations highlighting the station's current work will make up the program. Special emphasis will be placed on plant diseases, a field in which the station has a very active research program.

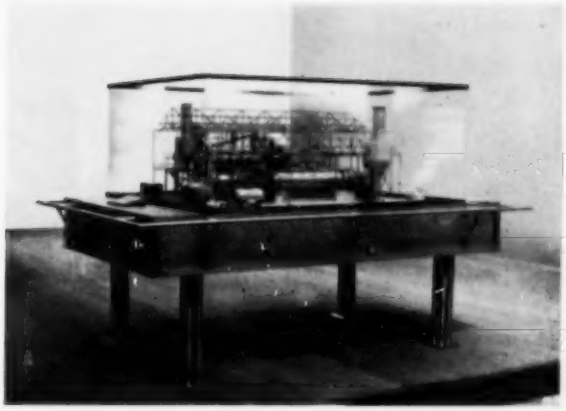
Detailed plans for the field day will be announced at a later date.

•

New Dupont Disinfectants

Two new liquid seed disinfectant formulations have been announced by E. I. du Pont de Nemours & Co., Wilmington. They are for use on small grains (wheat, rye, barley, oats and flax). Both formulations are based on a combination of phenyl mercury acetate and ethyl mercury acetate. Du Pont Liquid 364 is a concentrate to be diluted with water for use in slurry treaters, while Du Pont Liquid 244 is for use undiluted in ready-mix (fully automatic) treaters.

The new products are said to control certain soil-borne and seed-borne diseases. When applied according to recommendations, they are reported to improve stands by preventing seed decay and reducing seedling blights caused by seed-borne and soil-borne organisms. The new products are both sold in drums of five and 30 gallons. Du Pont Liquid 244 is available also in 50-gallon drums.



Model Plant on Display

Chemical and Industrial Corp. of Cincinnati were to have a working model of their complex fertilizer plant, employing the PEC patented carbonitric process, on display at The Greenbrier during the National Fertilizer Association convention. This is a complete scale model of an existing plant that is producing 500 tons per day of high analysis fertilizer.

•

Fertilizer Use Increasing

A survey of farms in the midwest indicates record buying of fertilizer this spring, according to a survey just completed by the *Minneapolis Star*. Controls on acreage assigned to wheat and corn have spurred demand; although fertilizer use has been increasing steadily in recent years.

With smaller acreages of wheat and corn, farmers are going to fertilize heavier and try to increase yield. County agents report that much of the increased use in the corn growing areas is in nitrogen. Farmers are also fertilizing pastures and using starter fertilizers on new seedings of grass and legumes.

•

Kraft Distributes Sample Bags

A recent promotion campaign by the Kraft Bag Corp., New York, included the distribution of 80-lb "Kraftlok" fertilizer bags to prospective users. A sales message was printed on the face of the bag, which was sent along with three descriptive circulars.

Penn. Indl. Names Steinmark

E. G. Steinmark has been named Philadelphia district sales manager of Pennsylvania Industrial Chemical Corp., Clairton, Pa. He has served with the company as chemist, expediter and sales executive for the past 6½ years. Mr. Steinmark attended Franklin & Marshall College and was graduated from the University of Pittsburgh.

•

Corn Borer Losses $125 Million

The European corn borer in 1953 destroyed an estimated 90 million bushels of grain corn valued at more than $125 million, the U. S. D. A. reported recently. This loss, equivalent to 3 per cent of the past year's total grain corn production, was determined from data obtained by State entomological survey teams checking on borer populations in 726 counties in 26 eastern and midwestern States. On the basis of these county-by-county survey results, losses were computed for an additional 282 infested but unsurveyed counties in these States, and are included in the 90 million bushel corn loss figure. Although 35 per cent of the borer-infested counties in the U. S. are not accounted for in this loss figure, most of these counties contain relatively light infestations that caused only small corn yield reductions.



Relief... for a production pain

What's your particular "ache"? Looking for ways to cut costs...improve production...speed plant operations...reduce maintenance costs?

Here's a prescription that can provide an effective solution for you... the specialized service offered by your Chain Belt Field Sales Engineer and the outstanding performance of Chain Belt Equipment:

for example: If bucket elevator chain breakage is your "headache," Rex® S-858 and S-856 chains will provide relief. These precision-made steel chains will not break...properly applied, they may *wear* out after the longest possible service life. They will outlast...outwear any other chains built for bucket elevator service.

for example: If you're having trouble with your chain drives, Rex Chabelco® Steel Chains are your answer. These rugged chains are designed and built for the toughest service, especially where dust, dirt or heat is a problem. They stand up under heaviest loads...transmit more h.p. per dollar.

for example: If maintenance is your problem, here's a suggestion. Use Rex Split Hardened Rim Traction Wheels and Sprockets. Just install the body, then each rim segment. Replacement of rim section can be done without removing the chain. Down time can be reduced with these long-wearing traction wheels and sprockets.

Whatever your needs...drive chain, conveyor and elevator chain, complete elevators, belt conveyors, feeders, roller bearings, buckets or sprockets, you'll relieve those production pains by looking to Chain Belt. See your local Field Sales Engineer or write direct to Chain Belt Company, 4795 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT COMPANY

District Sales Offices and Distributors in all Principal Cities



Large product storage building for dried triple superphosphate at Davison's recently completely plant at Bartow, Fla.



Airplane view of the $10,400,000 plant where the company will manufacture 200,000 tons of the fertilizer material each year.

Davison Starts Making Triple Super at Bartow

LARGE-scale production of triple superphosphate was started last month at the mammoth plant recently completed in Bartow, Fla. by Davison Chemical Corp. The plant, which will soon be producing triple super at a rate of 200,000 tons a year, makes Davison the second largest producer of the chemical. The unit is located on a 45-acre site near the company's phosphate rock mining properties in Florida, which has the largest known reserves of phosphate rock east of the Mississippi River.

Construction contractor for the plant was Consolidated Engineering Corp. of Baltimore. The Dorr Co., Stamford, Conn. was architect-engineer for the structure.

Dr. Allen T. Cole, manager, heads the operation, which is included in Davison's Florida Phosphate Division. Sales are handled through the company's Heavy Chemicals Department at Baltimore, with William Caspari, Jr., as general sales manager.

Necessary sulfuric acid for the super production is supplied by a plant at the site which was designed by Monsanto Chemical Co.

Briefly, here's how the Davison triple super plant operates: Phosphate rock is transferred from the silos to a grinding system, consisting of three roller mills in closed circuit with "whizzer" separators. After it is ground, the rock is transferred to four storage bins.

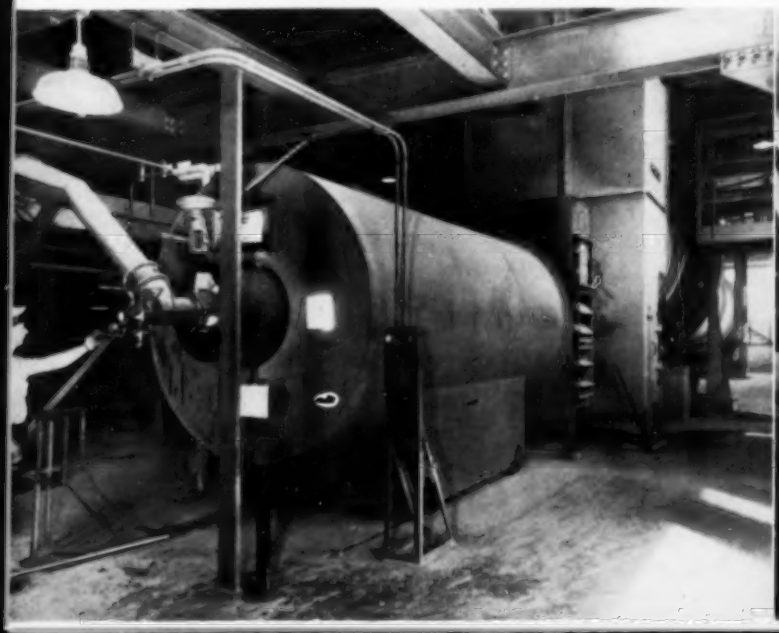
Next, the ground rock is treated with sulfuric acid, the slurry of phosphoric acid and gypsum thus produced being filtered to separate the gypsum from the slurry.

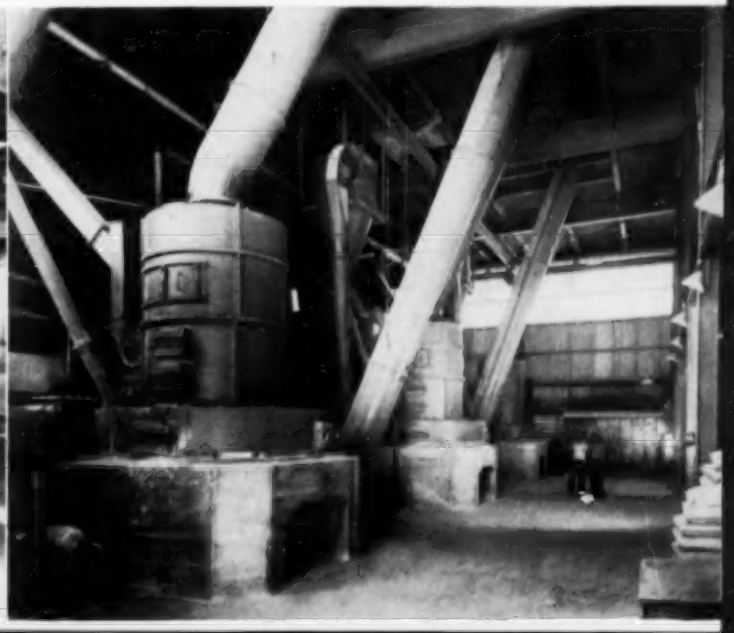
The phosphoric acid is concentrated and mixed with more ground phosphate rock in reaction vessels. The product from this reaction then is mixed with recirculated fine triple superphosphate and fed to a rotary dryer. The dried material is screened and stored in a building 325 feet long and 150 feet wide, with a capacity of 35,000 tons.

Approximately 20 per cent of the Davison product will be bagged for sale for direct application; the remainder will be shipped in bulk for mixing with other fertilizer materials. Both pulverized and granulated material will be available.★★

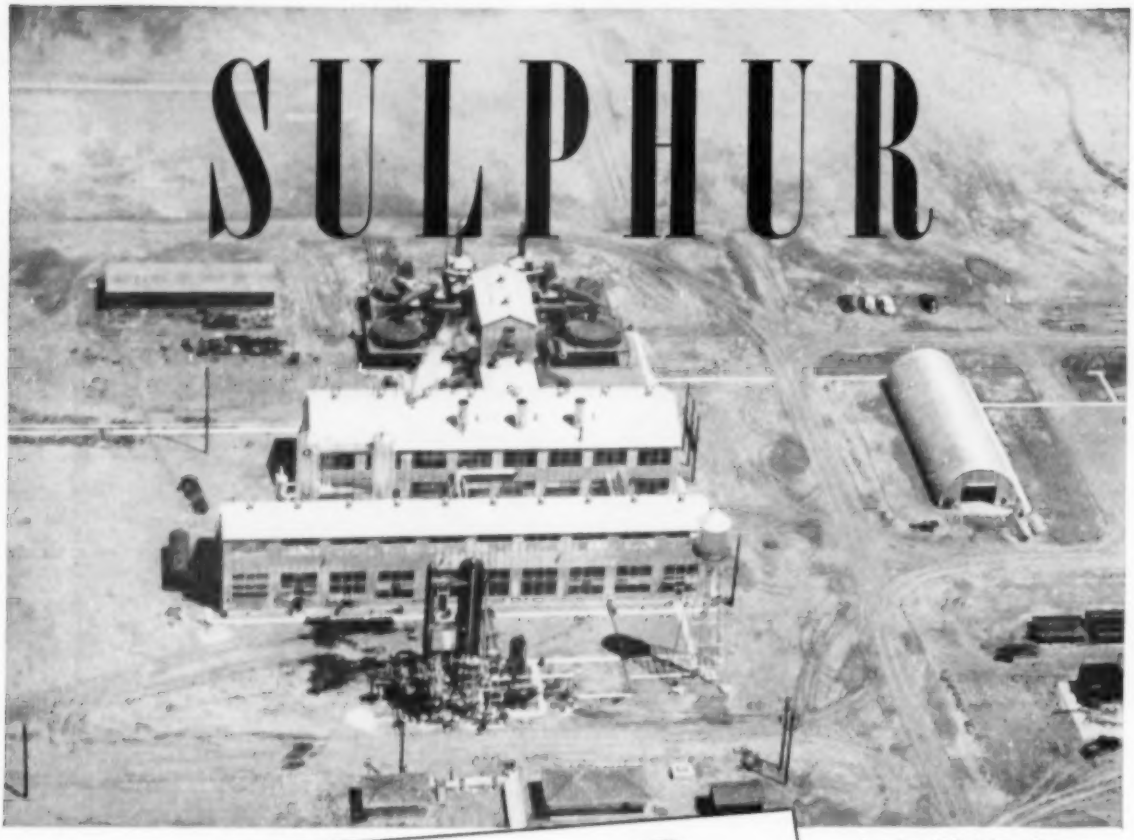
Triple super is dried in the oil-firer drier shown here after phosphoric acid is reacted with phosphate rock in the process.

Three Raymond 66-inch roller mills for grinding phosphate rock at Davison plant. Plant is located on a 45-acre site.





SULPHUR



Sour Gas (H_2S) Sulphur Recovery Plant, Worland, Wyoming.

Sour Gas...

...an increasingly important source

The largest elemental sulphur producing area in the world today is a narrow belt along the Coast of the Gulf of Mexico. Large quantities of elemental sulphur lie in natural beds in Japan, Italy, the Andes Mountains of South America, as well as many other sections of the world.

Most of the natural gas coming from fields on the East slope of the Rocky Mountains contains hydrogen sulphide rendering the gas "sour." The recovery of the sulphur from this gas, thereby purifying it, is a feat of chemical engineering.

Both metallurgy and chemistry combine in Canada, Norway, Sweden, Spain, Portugal, Germany, Great Britain, Holland and Egypt to produce substantial quantities of elemental sulphur from sulphides of hydrogen, iron and oil shale.

This company has the largest single unit in the world at Worland, Wyoming, recovering elemental sulphur from hydrogen sulphide contained in sour gas.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

Sulphur Producing Units

- NEWGULF, TEXAS
- MOSS BLUFF, TEXAS
- SPINDLETOP, TEXAS
- WORLAND, WYOMING

Ohio Tour Aug. 10-12

The 1954 summer tour of the Ohio Pesticide Institute will be held on August 10-12, inclusive, beginning at Wooster and finishing in Northwestern Ohio. Plot inspection will start on the 10th at Wooster and continue there until noon on the 11th. A dinner commemorating 100 years of entomology will be held at Smithville Inn the evening of the 10th. The afternoon of the 11th will be devoted to golf and sociability at a country club near Sandusky, followed by dinner there in the evening. The forenoon of the 12th will be spent in further plot inspection in the Toledo area and at the Ohio Muck Experiment Station located at Celeryville.

•

V-C Buys Ky. Plant

Virginia-Carolina Chemical Corp. Richmond, Va., purchased the fertilizer plant of Cumberland Chemical Co., Hopkinsville, Ky. early in May. V-C owns and operates thirty-seven fertilizer plants. Other plants serving the farmers of Kentucky are located at Mt. Pleasant, Tenn., and Cincinnati, Ohio. Operation of the Hopkinsville, Ky., plant by Virginia-Carolina, is scheduled to begin on July 1, 1954.

•

Pennsalt Names Two

Dr. William A. Lalande, Jr., was recently elected vice president and will continue as manager of research and development of Pennsylvania Salt Mfg. Co., Philadelphia. E. F. Beale was named vice-president and is treasurer of the company. The two vice-presidential posts are new offices just established by the board of directors.

•

Bemis Honors 50 Yr.-Men.

Three executives of Bemis Bro. Bag Co., St. Louis, each with 50 years of service with the company, were honored in Chicago recently by a group of Bemis officers and executives. C. F. Scott received a set of matched luggage, E. R. Bailey a camera and exposure meter, and R. H. Brown a gold wrist watch, in recognition of their many years of service. Mr. Scott, who became a member of the board of directors and was for many years manager of the Bemis Kansas City plant, is still active in company affairs as a counsellor. Mr. Bailey is active as manager of Bemis-San Francisco, and Mr. Brown, manager of the Bemis New Orleans plant until 1948, and since then a special representative of the company, retired on March 31 of this year.



New packaging design for American Potash & Chemical Corp., Los Angeles, is shown by W. J. F. Francis, general sales manager, western. The recently introduced containers are in the front row, and the former designs are in rear. The new bags are blue-on-kraft and green-on-kraft.

•

Gypsum Clears Farm Ponds

The U.S. Gypsum Co., Chicago, has issued a bulletin which cites studies made on clearing the water of muddy farm ponds, by use of gypsum. Agricultural gypsum, they indicate, flocculates the fine clay particles which muddy the water, causing them to settle. Initial use of 12 to 16 pounds of gypsum per 1000 cubic feet of water is suggested.

•

Atlas Awards Scholarships

Eight top chemistry, engineering and physics students were awarded $1,000 senior year college scholarships, in a program sponsored by the Atlas Powder Co., Wilmington. The eight were chosen from a group of 20 finalists who had spent two days in Wilmington being interviewed by Atlas officials and visiting the company's research laboratories and chemicals plant. Scholarship applications were submitted by over 150 students in the 40 colleges and universities participating in the Atlas program.

Grace-Davison to Merge

Stockholders of W. R. Grace & Co., New York, and those of the Davison Chemical Corp., Baltimore, early in May approved the proposed merger of the two companies. Davison will operate as Davison Chemical Co., Division of W. R. Grace & Co. Headquarters of the division will remain in Baltimore.

The present board of directors of Davison will continue as members of an advisory board of the Davison Division, and present officers of the company will continue in corresponding posts of the new division of Grace.

•

Crag Recommended for Lawns

Carbide and Carbon Chemicals Co., New York, are promoting "Crag Herbicide-1" this season for use on lawns. The product was previously offered primarily for use in vegetable and flower gardens, and now after two years of testing is reported to give good results in control of crabgrass and other annual weeds on lawns.

•

Fulton Bag Advances Three

Fulton Bag and Cotton Mills' Kansas City plant recently announced the advancement of A. J. Reinberg from sales representative to assistant manager. H. C. Forrester was named production manager, and J. R. Jones was named office manager.

An Opportunity

Centennial of Entomology 1954

- *Offers the industry an opportunity to tell the public about benefits from pesticides in their daily lives*
- *A chance to pay tribute to the scientists who have been instrumental in improving health and agriculture through pest control in this country and abroad*
- *A medium for presenting the importance of chemistry in our economy and to our well-being in war and peace*

The celebration of the one hundredth year of professional entomology in the United States was created by agricultural, industrial and public health leaders to direct attention to the importance of pest control and to honor entomologists. Every opportunity should be used to carry a message about pest control through press, radio, TV, speeches and advertising during 1954.



NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION

910 SEVENTEENTH STREET, N. W. WASHINGTON 6, D. C.

NEWS Brevities

PACIFIC GUANO CO., Berkeley, Calif., announced recently the resignation of John J. Bingham, manager of the insecticide division, effective, June 1st. Mr. Bingham, plans to enter the agricultural chemical business in Bakersfield, Calif.

•

AMERICAN AGRICULTURAL CHEMICAL CO., Buffalo, has filed plans with the city to erect a manufacturing building at an estimated cost of $20,000.

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VALLEY FERTILIZER CO., Alamosa, Colo., operating for about a month, produces commercial mixed fertilizer.

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FRANK E. MAPLE has been named general manager of the industrial chemicals sales department of Commercial Solvents Corp., New York. He previously was general sales manager for industrial chemicals.

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DR. J. P. MILIONIS is a new member of the new Product Development Department of American Cyanamid Co., New York. He will be concerned with general development projects and will introduce new Cyanamid products to the chemical industry. J. C. PULLMAN was recently named assistant to the manager of the department.

•

BEN D. MCCOLLUM has joined J. R. Simplot Co. as sales manager of its fertilizer division with offices at Pocatello, Ida., succeeding E. W. Hansen.

CHANGES at Niagara Chemical Division of Food Machinery and Chemical Corp. include appointment of Dr. Oscar H. Johnson as director of research of Niagara and Dr. C. O. Eddy as manager of the development department.

•

KINGMAN LIQUID FERTILIZER CO., of Kingman, Kan., recently was incorporated with capital of $100,000. M. R. Heldenbrand, Sr., is president.

•

THE AGRICULTURAL INSTITUTE of Canada is sponsoring the formation of a new society to be called the Agricultural Pesticide Technical Society.

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PHILLIP BROTHERS CHEMICALS, INC., New York, was appointed last month by Universal Detergents, Inc., as exclusive sales agent. Phillip Brothers will handle distribution of Udet F surfactants and agricultural chemicals in foreign countries and will continue to distribute Udet F in Eastern U.S.

•

CORONET PHOSPHATE CO. employes were guests at a barbecue recently after working 180 days and 384,802 man-hours without a lost time accident. Approximately 350 employes attended the dinner, which was given by Smith-Douglass Co., of which Coronet is a division.

•

AMERICAN POTASH & CHEMICAL CORP. reported increased earnings in the first quarter of 1954 over the similar period last year. President Peter Colefax said sales jumped to $5,923,000, compared with $5,354,000 in 1953. Net earnings were up to $1.01 a share, compared with 96 cents for the first quarter a year ago.

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AMERICAN CYANAMID CO. *chemist* Dr. Raymond A. Dingee died April 28 in his office at the company plant in Stamford, Conn. He was 49.

•

FOUR FINANCIAL OFFICERS were elected to posts at Pennsylvania Salt Manufacturing Co. in May. Stanley L. MacMillan and R. Visscher Millar were reelected assistant treasurers. Eugene J. Harrington, Jr., formerly assistant secretary and assistant treasurer, succeeds Edward F. Beale, vice president and treasurer, as secretary of the company, and Frederick J. Emmenegger was named controller.

•

COVERING the New England territory for Marathon Corporation Chemical Division is Martin G. Battcock, of Worcester, Mass. He replaces Frank C. Morman, who was transferred to California.

•

R. L. HOCKLEY, vice president, and Robert L. Taylor, public relations director, of Mathieson Chemical Corp., took part in the recent observance of the nation's first Chemical Progress Week, May 17-22. Mr. Hockley served as regional chairman for Maryland, with Mr. Taylor as vice chairman.

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INCREASED production of pesticides was assured the Chemical Insecticide Corp., Brooklyn, last month when it was granted a $90,000 working capital loan by the Small Business Administration, president Arnold Livingston announced.

•

RECENTLY incorporated was Farmers Nitrate Association, Oswego, Kan., to market and sell agricultural products of its members. Capital is $70,000. Another incorporation is that of Pest Control, Inc., Scott City, Kan., to trade and deal in insecticides. Capital is listed at $5,000.

INDUSTRY *Patents*

The information below is furnished by patent law offices of

LANCASTER, ALLWINE & ROMMEL

402 Bowen Building
Washington 5, D. C.

The data listed below is only a brief review of recently issued pertinent patents obtained by various U. S. Patent office registered attorneys for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommell by sending 50c for each copy desired. $1.00 for Canada. They will be pleased to give you free preliminary patent advice.

2,668,749. Process of Preparing Calcium Carbonate Composition. Issued Feb. 9, to Brack B. McHan, Quincy, Ill., assignor to Calcium Carbonate Co., Chicago, Ill., a corporation of Illinois. A method of preparing pulverized limestone resistant to caking on extended storing comprising metering from .025 to .3% by weight of a substance containing the oleate radical onto dry limestone rock as it is continuously fed into a continuous type pulverizer, and rapidly pulverizing the rock therein in the presence of said oleate substance to form a product in which the size of substantially all particles ranges from 1 to 100 microns in diameter, the limestone being pulverized and passing through the pulverizer in about three minutes or less.

2,671,016. Herbicidal Composition. Patent issued March 2, to Floyd B. Erickson and Arthur H. Schlesinger, Dayton, Ohio, assignors to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware. The method of destroying undesirable plants which comprises applying to said plants a toxic quantity of a herbicidal composition comprising as the essential active ingredient an aromatic ketone selected from the class consisting of benzophenone, alkyl-substituted benzophenones in which each alkyl radical has from 1 to 5 carbon atoms, chlorine-substituted benzophenones, bromine-substituted benzophenones, benzophenones having both chlorine and alkyl substituents in which each alkyl substituent contains from 1 to 5 carbon atoms and benzophenones having both bromine and alkyl substituents in which each alkyl substituent contains from 1 to 5 carbon atoms.

2,671,043. Insecticidal Composition Containing Dodecachlorotetrahydro-4,7-Methanoindene and Method for Combining Noxious Organisms Therewith. Patent issued March 2, to Everett E. Gilbert, Flushing, N. Y., assignor to Allied Chemical & Dye Corporation, New York, N. Y., a corporation of New York. A new insecticidal composition comprising dodecachlorotetrahydro-4,7-methanoindene and an inert insecticidal adjuvant as carrier for the insecticide.

2,671,985. Herbicide-Resistant Coated Seed. Patent issued March 16, to Phelps Vogelsang, Midland, Mich., assignor to Processed Seeds Inc., Midland, Mich., a corporation of Michigan. A herbicide-resistant coated seed, whereby herbicidal agents having an adverse effect on the germination of seeds are substantially ineffectual as respects decreasing germination result of said seed, and whereby said seed is so protected from said herbicidal agents until germination conditions are afforded, and whereby substantially complete utilization of germination conditions occurs whenever afforded after planting, which comprises: a seed having substantially concentric layers of coating, at least one intermediate of said layers being activated wood char, and at least one other of said layers being food and growth stimulants for the germinating seed, the said coating including methyl cellulose as the binder.

2,673,158. Method of and Composition for the Protection of Grain. Patent issued March 23, to Elemer Klein, Tel-Aviv, Israel. A mixture adapted to be stored and to resist spoiling by weevils, including cereal grain and from 1 to 4% by weight of heat-expanded perlite to ground into a flour of a fineness such as to pass through a sieve of from 5,000 to 10,000 meshes per square centimeter without leaving on the sieve more than 2% residue.

2,673,172. Fungicidal 1,2,3,4,7,7-Hexachloro-5-(Aminophenyl) - Bicyclo-[2.2.1]-2-Heptene. Patent issued March 23, to Percy B. Polen, Morton Kleiman, and Henry G. Fechter, Chicago, Ill., assignors to Arvey Corporation, a corporation of Illinois. 1,2,3,4,7,7-hexachloro - 5 - (aminophenyl)-bicyclo-[2.2.1]-2-heptene. The method of controlling fungus growths which comprises applying to fungi and their places of growth 1,2,3,4,7,7-hexachloro - 5 - (aminophenyl-bicyclo-[2.2.1]-2-heptene.

2,673,795. Phosphate Fertilizers. Patent issued March 30, to John Herbert Hudson, Norton-on-Tees, England, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain. A process for the production of granular compound phosphate fertilizers which comprises the steps of reacting ground mineral rock phosphate with insufficient aqueous nitric acid for the complete conversion to mono-calcium phosphate of the tri-calcium phosphate content of the mineral rock, the reaction with the acid being carried out in two stages, the first being of short duration not exceeding 2 minutes under conditions of rapid mixing and during which the whole of the required acid is added, and the second for a period of less than 15 minutes under conditions of moderate agitation; then adding with continued mixing over a period of less than 10 minutes, aqueous ammonia to convert substantially all the mono-calcium phosphate produced in the reaction with nitric acid to di-calcium phosphate, while maintaining the mass at a temperature of not more than 70° C.; adding with continued mixing over a period of less than 10 minutes, ground ammonium sulphate in an amount not less than that required to convert unreacted calcium nitrate to calcium sulphate and ammonium nitrate; adding, with continued mixing, dried material from the final step of the process in such quantity depending on the concentration of the nitric acid and the aqueous ammonia employed to give a mixture having a water content of between 6% and 12 by weight; said mixture being then passed to at least one rotary drier in which the granulation is completed and the granules are dried by a counter-current stream of hot gas so that the temperature of the granulated material leaving the drier is not higher than 100° C.

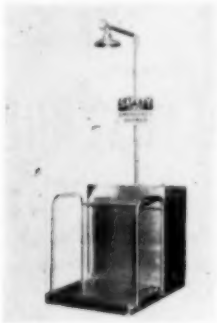
2,673,796. Fertilizers. Patent issued March 30, to Nathaniel Percy, Norton-on-Tees, England, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain. A process for the production of granular complete fertilizers which comprises the steps of reacting ground mineral rock phosphate with insufficient aqueous nitric acid for the complete conversion to monocalcium phosphate of the tricalcium phosphate content of the mineral rock, the reaction with the acid being carried out in two stages, the first being of short duration not exceeding 2 minutes under conditions of rapid mixing and during which the whole of the required acid is added, and the second for a period of less than 15 minutes under conditions of moderate agitation; then adding with continued mixing over a period of less than 10 minutes, aqueous ammonia to convert substantially all the mono-calcium phosphate produced in the reaction with nitric acid to di-calcium phosphate, while maintaining the mass at a temperature of not more than 70° C.; adding with continued mixing over a period of less than 10 minutes, ground ammonium sulphate in an amount not less than that required to convert unreacted calcium nitrate to calcium sulphate and ammonium nitrate and muriate of potash

(*Turn to Page 161*)

Suppliers' BULLETINS

Outdoor Safety Showers

The Engineering Corporation of America, Westfield, N. J., have recently issued a bulletin describing their line of emergency safety show-



ers. The equipment may be used indoors, or outdoors in cold climates, without danger of freezing. Combination showers with eye, nose and mouth wash fountains are also offered by the firm.

•

Livestock Pocket Guide Released

A new livestock pocket guide has just been released by California Spray-Chemical Corp., Richmond, Calif. Called the "Ortho Livestock Pocket Guide and Gestation Chart," the new folder is in pocket size, and covers in "capsule" form a calendar of pest control for beef and dairy cattle, sheep and goats, horses and mules, hogs, poultry, and barnyard areas.

Spray schedules are outlined by the month, and a "wheel" gestation chart is incorporated into the folder, indicating the gestation periods for cows, mares, rabbits, sows, ewes and bitches.

Company officials point out that the pocket guide is part of Calspray's educational campaign on control of livestock parasites, which cost livestock men millions of dollars every year. Last year the company released a color-and-sound motion picture called "Livestock Pest Control," and published a 30-page book called "Ortho Livestock Digest". Copies of the new pocket guide are being distributed free of charge to livestock men by Ortho dealers.

•

Hypro Offers Kits

"Build-it-yourself" kits for converting Hypro pump models into gas engine portable pump units have been designed and purchased by Hypro Engineering, Inc., Minneapolis. The kit includes the pump with hollow stainless steel shaft to fit ½" diameter engine shaft, base plate for engine, carrying handle, torgue arm and necessary bolts and nuts, together with instructions on the unit's assembly and use.

•

Ammonia Treatment Kit

Mine Safety Appliances Co., Pittsburgh, announces its "Anhydrous Ammonia First Aid Kit" for treatment of ammonia burns. The new kit contains necessary materials for treatments, including gauze bandages and pads, antiseptic swabs, eye dressings, bandage scissors, eye cup, plastic bottles of acetic acid, sodium thiosulphate and boric acid solutions and a special instruction and contents sheet. The kits are of regular "all-weather" construction. Mounting brackets allow them to be attached to wall or vehicle.

•

New Link-Belt Book

Plants and equipment for the fertilizer industry are described and illustrated in a new 16-page Book No. 2459, just released by Link-Belt Co., Chicago. Many recent improvements in processing techniques are illustrated.

Burrows Equipment Described

Burrows Equipment Co., Evanston, Ill., describe a series of units adaptable to agricultural use. A small vertical mixer having a capacity of 1.5 to 9 bushels is suggested for small batch mixing operations. A portable aluminum elevator, with capacities of 175 to 600 bushels per hour is offered in 16 and 20 ft. lengths, and an aluminum bag conveyor has a capacity of 150 lbs unit load, or 300 lbs distributed load.



Above: Burrows apex bagging scale for 100 pound bags.



Photograph shows Burrows aluminum bag conveyor being used for loading bags of fertilizer on to a truck.

Shell Dieldrin Booklet

Shell Chemical Corp., Denver, recently issued an 8-page booklet on chinch bug control with dieldrin for distribution by dealers and suppliers. The booklet describes chinch bug damage and suggests control measures for small grain crops and corn. The booklet points out that treated grains should not be harvested for at least seven days because of the residual properties of dieldrin.

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Bibliography on Systemics

Insecticide manufacturers who are contemplating entering the systemic field, or who are otherwise interested in systemics, now can get an up-to-date bibliography on the subject from the USDA. Prepared by Paul A. Giang, Section of Insecticide Investigations, the booklet lists hundreds of articles and references to systemic insecticides which appeared in the literature up to December, 1953. The references are arranged alphabetically according to authors and a key is provided to indicate subject matter of the articles.

A brief history of systemics is provided as general background material in the bibliography.

NEW BOOKS

Sulphur Data Book Published by McGraw Hill Book Co., New York., 5 x 8½ inches, cloth binding, 140 pages, price $5.00 A compilation of technical data on sulfur compiled by Freeport Sulphur Co. It includes material from literature and private sources. The text is broken down into five major sections which present a wide range of information on the nature of sulphur, its physical and chemical properties, reaction thermodynamics, solubilities and analysis.

THE MECHANISM OF ENZYME ACTION by W. D. McElroy and B. Glass. 7 x 9 inches, cloth binding, 820 pages. Published by Johns Hopkins Press, Baltimore. Price $11.00

VEGETABLE FATS & OILS by E. W. Eckey. 7 x 9 inches, cloth binding, 836 pages. Published by Reinhold Publishing Corp., New York. Price $16.50

CALCULATIONS OF ANALYTICAL CHEMISTRY by L. F. Hamilton, S. G. Simpson. 7 x 9 inches, cloth binding, 340 pages. Published by McGraw-Hill Book Co., New York. Price $5.00

RODENT CONTROL THROUGH WEED CONTROL. Objection to weeds and grass as a sanitary factor is based on fact that they harbor rats and other vermin. Bulletin reviews chemical weed control, and rodent control. Bulletin by E. I. du Pont de Nemours & Co., Inc. and the A.O.M. Sanitation Committee.

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Soil Testing Bulletin

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G. E. Lambert, Yuba City, Calif., describes an agricultural sprayer having a capacity of about 30 gallons per hour, and a boom spread of 68 feet. He points out that the equipment is especially designed for the commercial operator, has mechanical agitation, and will travel 45 miles per hour on the highway. The boom of the sprayer may be raised to a height of seven feet.

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Leslie M. Smith
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New Malathion "Fly Flakes"



A new product of the Florida Agricultural Supply Co., Jacksonville, Fla., a Division of Wilson & Toomer Fertilizer Co., is a malathion impregnated flake form for the control of flies, marketed under the name, "Fly Flakes." The flakes contain one per cent malathion and are suggested for use in dairy barns, stables, poultry houses, processing plants, picnic areas etc.

The manufacturer points to the ease of application as one of the main advantages of this form of fly insecticide. The flakes may be sprinkled directly from the shaker-top packages, or scattered by hand from larger containers. The company recommends that a rubber glove be used for hand scattering. Two to three pounds of the flakes are reported to effectively reduce the fly population in the average dairy barn. Package sizes are 1, 5, 10 and 25-lb containers.

•

British Weed Report

Proceedings of the first British Weed Control Conference, held Nov. 3-5, 1953, are reported in a 484 page paper bound volume. Formal papers presented in the report cover: the cost of weeds, weed problems in forestry, grassland, fruit and vegetable crops, weed seeds; and spraying problems. Research reports deal with effects of 2,4-D and MCPA on cereals; formulations of the esters of growth regulating herbicides; application volume rates; weed control in grasses, sugar beet and lucerne.

Also reported in the proceedings is a paper on the trends in spray machinery for weed control, which reviews the selection of equipment and describes the type of material used currently.

Copies of the report are available from the Association of British Insecticide Manufacturers, 86 Strand, London, W.C.2, England, at 30/-.

New Fertilizer Applicator

A new type fertilizer applicator, which when combined with other equipment can take care of three operations in one, has been developed by Century Engineering Corp., Cedar Rapids, Ia. The applicator, called the Century PTO spreader, can be combined with a land roller on which has been mounted a Century all-purpose seeder, to combine all three operations.

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From the Editor's Mailbag . . .

Editor,
AGRICULTURAL CHEMICALS
175 Fifth Avenue
New York 10, N. Y.

Dear Sir:

The editorial that appeared on page 33 of the April 1954 issue of *Agricultural Chemicals* has been called to my attention. That editorial criticizes statements included in the February issue of the USDA Farm Cost Situation with respect to use of fertilizers.

I believe you have misinterpreted the meaning of the statement on page 20 of the Farm Cost Situation. The statement does not say that farmers should "shun" use of fertilizer on acreage controlled crops, but merely calls attention to the possibility that the short run surplus problem would be accentuated if all farmers used fertilizer "up to the most profitable rate." Most farmers, of course, are not now and never have applied this amount of fertilizer, as shown in many of the studies we have made and reports we have released.

We see no conflict in the statement in the Farm Cost Situation and in the article of H. E. Myers included in the April issue of *Agricultural Chemicals*. Myers says in his article immediately preceding the quotation from his article that was used in your editorial that "additional fertilizer use, where needed, will increase production and therefore may contribute to the surplus problem." This recognizes the same situation mentioned in the Farm Cost Situation. He goes on to say that it would not be sound to reduce the surplus by eliminating the use of fertilizers, to which we would wholeheartedly agree. We would go further to say that it would generally be unprofitable for individual farmers even to *reduce* the use of fertilizer on these crops.

What was intended in the Farm Cost Situation, though apparently not too well stated, was to call attention to a problem and to suggest that farmers carefully consider their fertilizer program on a whole-farm basis and use additional quantities on non-surplus crops, particularly in establishing hay and pasture crops on diverted acres.

The results of our research definitely indicate the importance of use of fertilizer in present day farming, and we recognize the need for gradual expansion in its use.

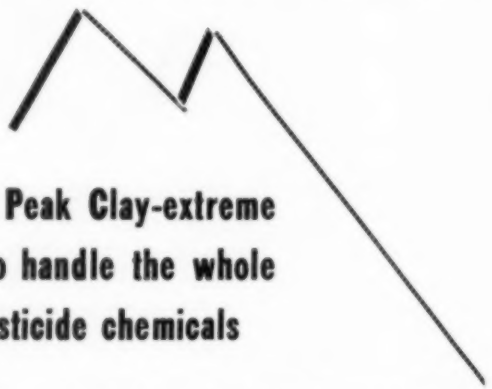
Very truly yours,
CARL P. HEISIG,
Chief of Branch,
U.S.D.A.,
Washington, D. C.

Editors Note: We are happy to have the comments of Mr. Heisig, clarifying this situation. Much discussion was aroused in the industry by the USDA report.

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WASHINGTON REPORT

(From Page 89)

Well, there was a lot of talk about hats during a recent government conference, when the same group of men got together, sporting new creations. What it amounted to is the regular crew from several USDA bureaus, plus Food and Drug and agricultural experiment stations representatives, got together for more shop talk about procedure, for registration of new pesticides.

From the industry point of view, you will be glad to know that even with all the reorganization, the problem of registering new pesticides hasn't been lost. The same crew is there and they are trying to make life as easy for you as possible — provided of course, you have the necessary data.

Some of those attending the session want you to know they believe progress

the process of applying for the registration of a product you're in a much better position to judge★★

DORWARD REPORT

(*From Page 85*)

less than 1 percent of the insects were viruliferous from either source. Populations of the leafhopper were very low in cantaloupe fields in Salt River Valley of Arizona and percentage carrying curly-top was also low. It is of interest that a specimen of beet leafhopper was collected during the second week of May in horseradish fields of Illinois. Onion maggot flies were emerging in large numbers in the Lake Labish area of Oregon early in the month. Onion growers in this area suffered very heavy losses during 1953 from this insect.

Tent caterpillars, which during the past few years have been of concern in several states, were hatching in Minnesota and Idaho by the middle of May. The outbreak which had been predicted for northwest Oregon was materializing.

Mexican Fruit Fly

THE Mexican fruit fly (*Anastrepha ludens* (Loew), a pest of citrus occurring in the United States only in the lower Rio Grande Valley of Texas, has been found twice recently in the Tijuana, Baja California, Mexico area. The first fly, a female, was found in the vicinity of Tijuana January 22. The last collection consisted of one male adult which was trapped in a backyard sapote tree located less than one mile south of the California border. Prior to the January find the Mexican fruit fly had not been taken in this section of Mexico. In soil sifting under the tree where the second catch was made, two empty pupal cases were found. Arrangements were made with Mexican authorities to spray all hosts in the city of Tijuana. A similar program is underway in a limited area of southern California. These operations are cooperative projects with the California State Department of Agriculture.

Fruit Insect Conditions

IN southern New Jersey first brood Oriental fruit moth was causing terminal injury in unsprayed peach trees. The peak spring brood flight occurred in the Vincennes area between April 22-27. There was a light infestation of the insect in the mountain apple area of Georgia. Moths were taken in early May in Monroe and Niagara Counties, New York. By the first of May the majority of the larvae had left twigs in Arkansas. Half-grown larvae were found in Pulaski County, Illinois, and the Independence, Missouri, area the last of April.

By the middle of the month rosy apple aphid was becoming injurious and widespread in the Kearneysville, West Virginia, area and in untreated or improperly treated apple orchards at Vincennes, Indiana, and in southern Illinois.

Activity of other major fruit pests including plum curculio, codling moth, and spider mites was about normal for the season.



N.F.A. PROGRAM

(*From Page 53*)

4:00 P.M. to 5:30 P.M.—Garden Party for the Ladies.

6:00 P.M.—Refreshment Hour — American Potash & Chemical Corporation, H. J. Baker & Bro.

9:00 P.M.—Reception — Southwest Potash Corporation

10:00 P.M.—Cabaret Party — Music and Dancing.

Tuesday, June 15

8:30 A.M.—Breakfast Meeting — Plant Food Research Committee

10:00 A.M.—GENERAL MEETING

Address: Louis Ware, Chairman of the Board of Directors, National Fertilizer Association.

Address: "Putting the Atom to Work in Industry and Agriculture," Honorable W. Sterling Cole, Congressman from New York, and Chairman of the Joint Congressional Committee on Atomic Energy

Business Meeting

2:30 P.M.—Ladies' Bridge and Canasta Party

6:00 P.M.—Refreshment Hour — International Minerals & Chemical Corporation

7:45 P.M.—Convention Dinner

9:30 P.M. to 1:00 A.M.—Dancing—Entertainment: Ned Smith and June Sayer — Raymond Chase — Concertina Virtuoso.

Wednesday, June 16

9:30 A.M.—Organization Meeting—New Board of Directors

10:00 A.M.—SYMPOSIA — Sponsored by Plant Food Research Committee

1. What Makes Fertilizer Move?

O. E. Anderson, Secretary, Ohio Bankers Association; Harold R. Dinges, Director of Product Sales, Spencer Chemical Company; George E. Smith, Professor of Soils, University of Missouri; Moderator: H. H. Tucker, President, Coke Oven Ammonia Research Bureau.

2. Granulation

W. W. Coffin, Link-Belt Company; Robert J. Engelhardt, Project Engineer, John J. Harte Co.; John O. Hardesty, Senior Chemist, Agricultural Research Service, U. S. Department of Agriculture; L. D. Yates, Division of Chemical Development, Tennessee Valley Authority; Moderator: Edwin C. Kapusta, N.F.A.

12:00 Noon—Adjournment



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GREY MOLD ROT

(*From Page 83*)

maturing berries; May 19, five days before the first picking. The amounts of 50% Captan used per acre per application were 6.6, 5.0, 7.0, 6.0, and 6.0 pounds, respectively. One more spray than would normally be required was applied after sub-freezing temperatures April 17, 18, and 19, and destroyed the early blossoms and thus delayed the first picking about two weeks. The early obser-

TABLE 1

Analysis of Gray Mold Infection*

Location in patch	Number of clusters infected among 500 per plot, May 12		Per cent berries infected of 500 per plot, May 22	
	Treatment	No Treatment	Treatment	No Treatment
East end	6	20	4.0	13.0
Middle	5	19	0.5	9.6
West end	2	3	0.0	6.5

*Comparison of treated and untreated strawberry plots, May 12 and 22.

TABLE 2

Captan for Control of Gray Mold*

Dates of picking	Yield in crates per row		Per cent increase
	Treated plots	plots not treated	
May 24	3.4	2.0	70.
May 26	8.9	5.0	78
May 28	3.4	2.0	70
June 1	5.7	3.0	90
Total	21.4	12.0	78
Per acre yield	193.0	109.0	78

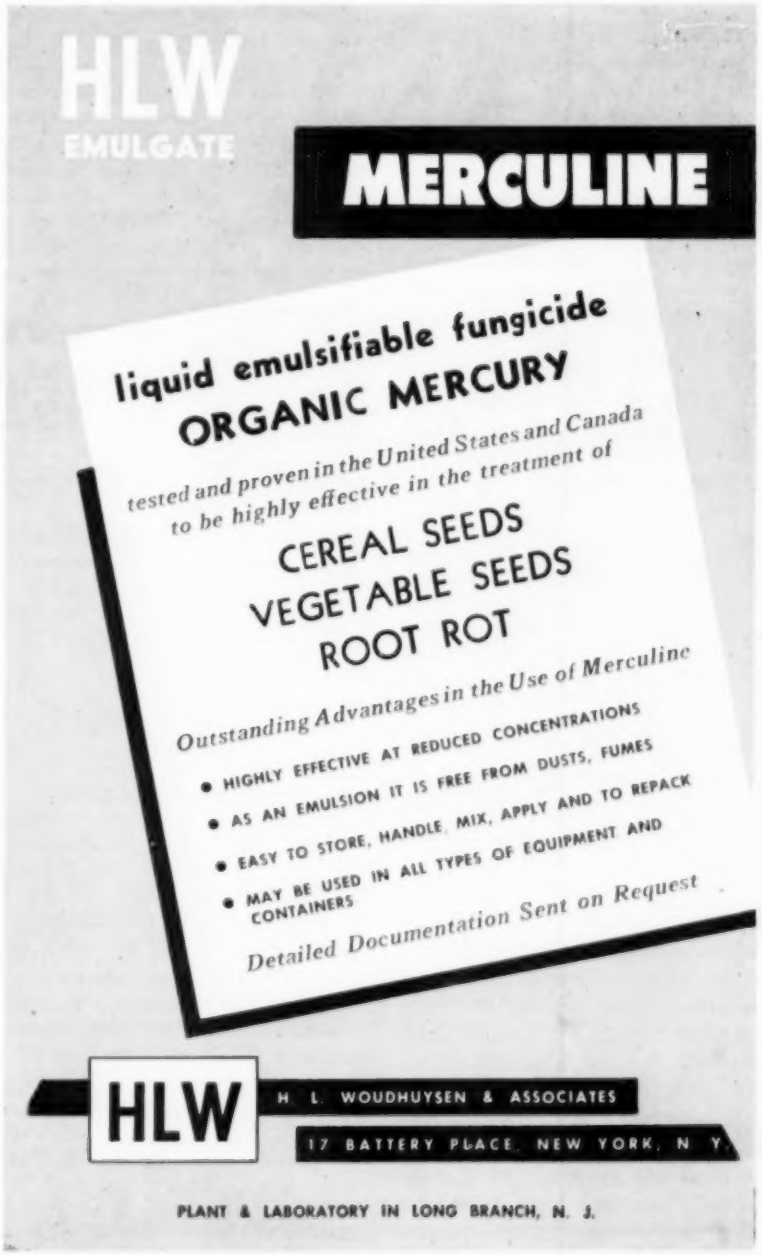
*Comparison of yield records in crates per row from treated and untreated strawberry plots.

vations for the degree of gray mold infection are recorded in Table 1.

It is evident from these data that the treatment was effectively reducing the amount of gray-mold infection. It is also interesting that the degree of infection varied considerably from one end of the patch to the other. This condition seems to be characteristic of this disease and may reflect the amount of inoculum carried over from the previous season. Blossom infection is likely to be a more important factor than fruit infection during a dry spring. In Illinois there is always sufficient rainfall in the early spring to cause blossom infections but frequently a dry period occurs just prior to or during harvest and fruit infection then may not be serious.

The data in Table 2 show that Captan definitely increased production. Many factors could be responsible for an increased yield. Since the check manifested approximately 75 per cent more gray mold infection than the treated plot, disease control was certainly an important factor. Other workers have reported that Captan gave a greater increase in yield than other fungicides and also that Captan-sprayed plants seem more vigorous than the controls. Observations on June 3 indicated that the plants had benefited nutritionally from the Captan and that fruit size was increased. For example, from 8 quarts of berries picked at random from the sprayed and unsprayed rows, the treated berries averaged 92 berries per quart as compared to 123 per quart from the untreated rows.

Dr. Powell reported additional evidence that Captan will increase



production, from correspondence with W. D. Armstrong, of the Kentucky Agricultural Experiment Station. Three sprays of Captan were applied at approximately ten-day intervals on a one-year-old bed. Two hundred and thirty six crates were harvested per acre from the treated plot as compared to 158 from the control. On a two-year bed 157 crates per acre were obtained from the treated and 146 from the untreated plants. Disease data were not collected from the Kentucky plots.

Mr. Armstrong suggests an explanation for the considerable difference between the results in these two patches. The first-year planting had been somewhat over-fertilized and growth was very tall and vigorous, resulting in a condition conducive to rot. It was encouraging that under these circumstances the Captan sprays gave an outstanding increase in production. The second-year patch was less vigorous, with lower foliage and more widely spaced plants and consequently less shade, so that there was less tendency for the berries to rot even in the non-sprayed area. Hence, the Captan sprays were less advantageous.

In the Illinois experiments the effect of field fungicide applications on post-harvest infection was determined. Berries were picked from each plot and placed in common storage for 48 hours. After this 26 of 777 berries from the treated rows, or 3.3 per cent showed gray mold, as compared with 131 of 985 berries, or 13.3 per cent, from the untreated rows. Thus berries are given substantial post-harvest protection by field treatments with Captan.

To Summarize: Five applications of 50% Captan at 6- to 10-day intervals, starting with the appearance of the first bloom, decreased gray mold infection of the blossoms and fruit approximately 75 per cent. Production was increased from 109 to 193 crates per acre. On June 3, after the fourth picking, Captan-sprayed berries averaged 92 per quart as compared to 123 per quart for the untreated fruits. Captan delayed the development of post-harvest rot.★★

ENTOMOLOGY

(From Page 59)

ods which required the felling of trees prior to trunk treatment.

Water emulsions rather than oil solutions of certain insecticides are being more and more widely used against bark beetles. This is resulting in reduced control costs inasmuch as it is no longer necessary to transport huge quantities of oil to the remote areas of control operations.

Since World War II it has also been shown that at least one species of destructive forest insect, the western pine beetle, can be prevented from developing to serious outbreak levels in certain ponderosa pine stands in the West. Research has shown how beetle-susceptible trees can be identified. Once they are identified they can be removed from the stand and marketed. The residual stand is thereby rendered less susceptible to injury, and the whole operation can be conducted as a profitable business undertaking.

It can be seen, therefore, that forest entomology has come a long way in the past 100 years. It is not to be construed from this discussion, however, that the forest insect situation is now well in hand. On the contrary, it is probably more serious at present than ever before. In spite of past achievements in research and control, we are today suffering from some of the most severe outbreaks ever recorded in the spruce and fir stands in the West. The need for increased research is greater than ever. We are still a long way from understanding the causes of outbreaks, from being able to predict when and where they will occur, or from knowing how to prevent them. These are some of the major problems in the field of forest entomology needing further investigation as we enter the second century of entomology in this country.★★



Observation on Insects and Mites in Western U.S.

By Dr. E. D. Essig
University of California
Berkeley, Calif.

ONE of the most interesting events in the history of western agriculture was the unintentional introduction of the cottony cushion scale into California. The insect was first noted in 1872 on acacia and orange trees which had been introduced into the San Francisco Bay region in 1876, and before anyone was aware of its true nature it was transferred to Southern California on a few lemon trees.

Its increase, spread and destructiveness were so rapid, complete and alarming that the California Board of State Horticultural Commissioners sought desperately to stay the havoc created by its spread. After numerous tests and experiments with the meager control methods then known, and with the aid of the Federal Government, it was decided to make a survey of the pest in its native environment and to secure, if available, the possible natural enemies that held it in check in Australia.

The results were quite phenomenal. A native ladybird beetle, *Novius* (*Vedalia*) *cardinalis*, together with several other related beetles and a small parasitic fly were secured and shipped to California and the *Vedalia* in particular was not only easily established in the new environment but reproduced rapidly and checked the ravages of the scale in a matter of one or two years. This first large-scale experiment in biological control attracted the attention of the entire world, and has to this day played a great part in the utilization of the natural enemies of injurious insects as a fundamental means of counteracting the ravages and destructiveness of insect pests to man, his crops and his domestic animals. It is rightly considered to have been one of the great achievements in the development of economic entomology.

This experience with the cottony cushion scale also taught another great lesson—the importance of taking suitable and adequate measures to prevent the importation and introduction from outside the country of serious insect pests and other or-

ganisms and animals detrimental to human health, and particularly food crops. Thus was created the system of agricultural quarantine that has played such an important role in keeping foreign pests from entering the United States.

However, in spite of the combined efforts and vigilance of county, state, and Federal agencies, many other serious foreign insect pests have been added to the hoards of native insects that have moved over from indigenous plants to the more than 300 kinds of agricultural crops cultivated in the United States. But for the timely and efficient development of biological control methods and the continual discoveries and the uses of phenomenal new insecticides which are now being made available in the control of injurious insects, the rapidly multiplying human race would soon be in dire need of food!

Some of the more important insect pests introduced into the western states give some idea of the difficulties that arise in connection with the very extensive types of agriculture that are practiced in this area.

The *codling moth* is reported to have reached California sometime in 1872 or 1873, and soon spread over the entire state. By 1926 it was also known to exist in the other western states of Colorado, Utah, Idaho, Nevada, Oregon, Washington, and also in British Columbia. In 1887 Paris green, London purple and white arsenic were used for its control. Arsenate of lead was available in 1904, and so-called neutral or basic arsenate of lead came into use about 1914.

The *peach twig borer* was reported in California as early as 1881 and has throughout the years been a serious pest to peaches, apricots and to a lesser extent to plums and prunes. Lime-sulfur spray was developed for the control of this pest in 1921-22.

The *woolly apple aphis* first appeared in Oregon and California in 1853 and is widely distributed and difficult to control because of the root infesting forms and alternate hosts.

The *red scale* on citrus was introduced in Arizona and Southern California about 1897 and was for many years a major pest of oranges and lemons, especially from 1907 to 1912.

The *citricola scale*, another pest of citrus, first appeared in Southern California in 1909; the *black scale* in 1862; the *Italian pear scale* in 1882; the *parlatona date scale* in Arizona and California in 1890; the *oyster-shell scale* on deciduous fruits and nuts in 1890; the *San Jose scale* in 1870; the *red scale* in 1870; the *purple scale* in 1890; the *citrus whitefly* prior to 1905; the *strawberry rootworm* in 1905; the *elm leaf beetle* appeared in Oregon in 1921, in Washington in 1922, and in California in 1924—90 years after it was introduced into the U. S. from Europe.

The *alfalfa weevil* arrived in Utah prior to 1904 when it appeared as the most destructive pest of alfalfa. Its distribution was rapid. It was observed in Colorado in 1917, in Nevada in 1920, in California in 1923, and Oregon in 1925.

The *vegetable weevil*, a native of South America, was first reported in Mississippi in 1922, in Alabama and Louisiana in 1927, and California in 1918. Although it appeared to be a potent pest, it proved to be of little economic importance on the Pacific Coast.

The *pepper weevil* was undoubtedly introduced into the United



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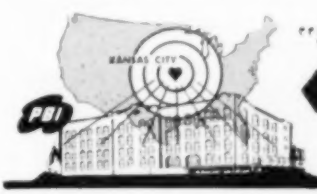
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States from Mexico. It was first reported in Texas in 1903. It was observed in New Mexico previous to 1922, and in California in 1923.

The *Hessian Fly* was first observed in California in 1879, and although it was reported to be abundant and destructive in 1885, it has not become a pest of great importance in the wheat fields of the hot interior valleys of the state.

The *currant and gooseberry fruit fly*, although observed in California prior to 1900, has been of little concern because these berries are not grown extensively in this state.

The *potato tuber moth*, of questionable origin, was first noted in California in 1854 and by 1874 had become a pest of considerable importance. In 1901 the first bulletin was published on it by W. T. Clarke. Up to within recent years, it has been a serious pest. However, with the development of modern insecticides, it is now effectively controlled.

Other important pests that appeared early in the west were:

The *European earwig*, first noted in North America in 1855, became a serious household and garden pest in Portland, Oregon, in 1909, in Seattle in 1915, in British Columbia in 1916, and in California in 1923. It is efficiently controlled by many of the newer persistent insecticides.

Locusts have troubled mankind since the earliest days of agriculture. In the west, serious invasions were reported as early as 1722. In California, they were recorded almost every year since 1823. Only in recent years the use of new and effective insecticides applied by airplanes has given promise of a new day in reckoning with these eternal pests.

The *grape phlloxera*, native on eastern grapevines, became a very serious pest of the European vines being cultivated in the west. It was first definitely found in California in 1863, and was a major pest, especially on vines grown on hilly and non-irrigated lands, but not so important in the valley alluvial, sandy soils.

Mites and Red Spiders

The common red spider, *Tetranychus telarius* (Linn.), was first recorded on the Pacific Coast infesting grapevines at Fresno, California, by Gustaf Eisen in 1876.

The so-called Pacific mite, *Tetranychus pacificus* (McGregor), was taken on prune trees near Stockton, California, in 1879.

The almond mite, *Bryobia praetiosa* (Koch), was first recorded in California in 1879, but there is reason to believe that it was introduced much earlier.

The citrus red spider, *Metatetranychus citri* (McGregor), appears to have been introduced in 1890.

The European red mite, *Paratetranychus* (C. & F.), was first recorded on deciduous fruit trees in California in 1913, but it is believed to have been present much earlier.

The pest-leaf rust mite was noted in 1913; the peach silver mite in 1914; the blackberry mite in 1921, and the fig mite in 1927—all in California.★★



Pests of Fruit & Vegetable Crops

By P. J. Chapman
N. Y. State Agr. Exp. Station
Ithaca, N. Y.

COSTS of pest control probably attain their highest levels, on an acre basis, among our fruit and vegetable crops. These products are sold in a highly competitive market where quality, eye-appeal and purity standards may be very exacting. Perhaps the most effective means available to a grower to produce the high yields and near-perfect end product demanded, is through the extensive use of pesticides. But their use may result in a large dollar outlay.

Here are a few examples: New York apple growers now spend about $98 per acre annually to control insects and diseases.[1] In a discussion of HCN fumigation, Dr. Walter Ebeling[2] states: "A citrus grower's pest control bill may for some years amount to well over $100 per acre." Dr. D. O. Wolfenbarger[3] estimates the present cost of insect and disease control for a crop of sweet corn in southern Florida at about $68 per acre, while Dr. W. A. Rawlins[3] places these same costs for potatoes on Long Island at $35 per acre.

The foregoing figures are not typical. These are only some of the higher examples for the fruits and vegetables. Whether pest control costs on individual crops are high or low, however, growers obviously would not be willing to incur them unless they proved profitable. By and large they pay off handsomely. Furthermore, there are situations, apples for example, where one might not end up with a crop of any description if pesticides were withheld.

A hundred years ago insects were allowed to feed more or less at will on farmers' crops. The idea has been handed down to us, however, that this was usually a tolerable situation because insect losses were less serious then than they are today. There is some truth in this contention. Our forebears did have fewer pests, and, with our expanding agriculture, introduction of improved varieties and cultural practices, planting of large tracts to single crops, etc., conditions may have been made more favorable generally for insect activity than prevailed a century ago.

Fruit growers of the 19th century did not have to contend with the oriental fruit moth, Japanese beetle, red-banded leaf roller, or until about 1890, with the apple maggot or San Jose scale. Our troubles with various species of mites on both fruits and vegetables seem to be of fairly recent origin. And until 1918 the Mexican bean beetle was only an obscure pest of beans in Colorado.

Even though allowances are made for the foregoing facts, pest losses were often very serious indeed in our fathers' and grandfathers' time. Thus, Wm. Kendrick[4] writing in 1833 says of the plum curculio: "With those fruits (plum, apricot and nectarine) the destruction is usually total. The apple—frequently survives, although disfigured in form and lessened in size." On codling moth damage, Slingerland[5] wrote in 1898: "From one-fourth to one-half of the apple crop in the United States is usually ruined annually by this insect." Another good example is the Colorado potato beetle. First appearing in Nebraska in 1859, this insect spread eastward at a rate of about 100 miles a year.

It was virtually unchallenged. In its wake, it left potato fields in shambles, with growers standing by, helplessly, unable to do much about it.

Then there is the question of quality standard differences. Due to our present highly competitive economy, we have become much more particular in what we will buy and eat than were our ancestors. A century ago consumers apparently accepted the presence of an occasional worm, or insect and disease blemish found in the fruits or vegetables he bought, as normal occurrence. Also indicative is the fact that early books on horticulture sometimes showed insects and disease blemishes on the fruits illustrated as if these were inseparable characteristics of the variety.

Everyone seems agreed that tremendous changes have taken place in the past century regarding the impact of insects on our health and economy. Are the insects wholly to blame for this situation? The writer suggests that it is more that we have changed — in population growth, farming methods, food standards, etc. — rather than that insects have altered their ways appreciably.

Practically speaking, the use of pesticides dates back only about 75 years. The first use of Paris Green occurred around 1867 in an attempt to control the Colorado potato beetle. About this same time too, people started to use kerosene and other petroleum products to control aphids and scale insects. Such usage was expanded with the introduction, in 1875, of a kerosene emulsion. Lead arsenate was discovered in 1891. Because of its safety to foliage, this product was soon being used to control codling moth and many other chewing insects affecting fruit and vegetable crops.

In retrospect, we now see that developments in chemical control progressed at a rather pedestrian rate from 1900 to 1940. Pesticide application equipment was gradually improved. And we had the addition of some botanical insecticides (nicotine, rotenone and pyrethrum) and several fluorine and dinitro compounds. Then came World War II and, in 1942, DDT.

DDT ushered in the era of synthetic organic pesticides. Featured by the chlorinated hydrocarbons and the organo-phosphorous compounds, these new materials have revolutionized pest control operations. DDT offered a sorely needed release to the apple growers who had been attempting to control the codling moth rather unsuccessfully with lead arsenate and nicotine preparations. The new organics have in fact now largely superceded the pre-DDT insecticides for the control of most fruit and vegetable pests.

During the same general period that our pesticides were being overhauled, came another development of near-equal importance. This concerned application equipment. These developments were motivated by a desire to reduce labor costs, speed up operations and to eliminate much of the drudgery of hand spraying. Out of this effort has come a shifting, in fruit circles, from the hydraulic sprayer to machines using the air blast principle. Another trend has been towards the use of spray mixtures in concentrated form. This latter practice saves water and extends spraying time.

Although aircraft is still not much used to apply pesticides to orchard crops, there has been increased employment of such machines to treat vegetable crops. A relatively new method of applying insecticides to row crops is the tractor-mounted sprayer modeled after the chemical weed sprayer. Its appeal is low equipment cost and effective pest control.

By and large we find ourselves today in a fairly advantageous position in regard to pest control. In fact, it often reaches a degree of perfection that would have been undreamed of a century ago. However, we are not without our problems, and there is ample room for improvement in our means and methods of pest control.

For example, the increasing tendency of insects and mites to develop resistance (tolerance) to pesticides and especially to some of the new "wonder" products presents a real challenge to the resourcefulness and ingenuity of the economic entomologist. There are also health hazard questions that necessarily arise from the use of pesticides of the character employed today. The increasing tendency to offer our fruits and vegetables in processed form has also created new problems for the entomologist. Manufacturers of such produce must

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[1] *Cornell Bul.* 886. 1952.
[2] *Subtropical Entomology.* p.244. 1950.
[3] Private communications, May 1954.
[4] *The new American Orchardist.* pp.32-5. 1833.
[5] *Cornell Bul.* 142 p.3. 1898.

(To be Continued)

FERTILIZER REPORT

(From Page 66)

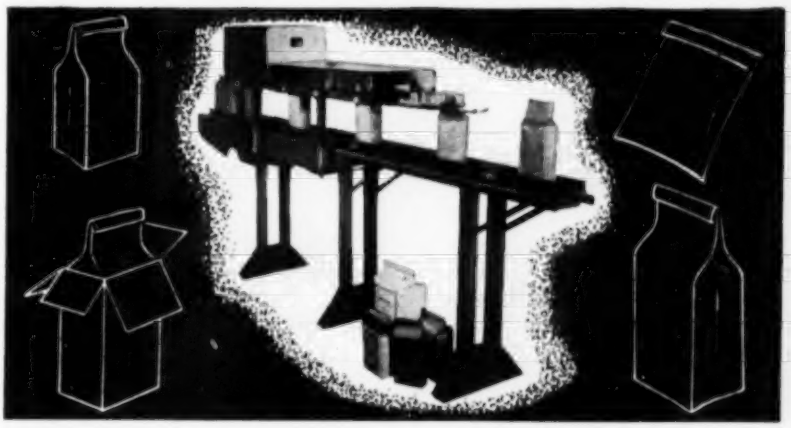
terials, the 60 per cent grade of potassium chloride increased 48,179 tons (38.8 per cent) while the 50 per cent grade decreased 12,290 tons (10.0 per cent).

The weighted average primary nutrient content of the principal classes of materials consumed is given, by states, in Table 7. These averages are based on the composition and amount of the individual material coming within the class. The data show the average quality of the materials composing the class. The national nutrient average, in per cent, of materials that contain only nitrogen was 28.54; those containing only P_2O_5 14.48 (available P_2O_5); only K_2O, 51.89; and those having more than one nutrient 21.96. The corresponding averages for these classes in 1951-52 were 27.96 (revised), 14.71, 49.98, and 20.97 per cent, respectively. With the exception of the class containing only P_2O_5 the nation averages for all the other classes in the current year were higher than in 1951-52, reflecting the greater use of higher quality materials. The drop in the average concentration of P_2O_5 materials was the result of the large decrease in consumption of basic slag and normal superphosphates and only a relatively small increase in use of triple superphosphates.

The national consumption of primary nutrients (Table 6) during the year ended June 30, 1953, was nitrogen, 1,637,056; available P_2O_5, 2,270,750; (total P_2O_5, 2,767,990); and K_2O, 1,740,210 tons. These quantities represented net increases over 1951-52 in nitrogen of 214,896 tons, available P_2O_5, 71,374 tons; (total P_2O_5, 89,920 tons); and K_2O, 158,743 tons. Consumption of primary nutrients was, therefore, 15.1, 3.2 (3.4), and 10.0 per cent greater than in 1951-52, respectively.

The amounts and proportions of the total quantity of nutrients consumed as mixed fertilizers were 728,095 tons or 44.5 per cent of the nitrogen, 1,782,286 tons (78.5 per cent) of the available P_2O_5, 1,920,472 tons (69.4 per cent) of the total P_2O_5, and 1,554,001 tons (89.3 per cent) of the K_2O. In 1952-53, the amounts consumed in mixed fertilizers were nitrogen, 12.3 per cent; available P_2O_5, 6.0 per cent; total P_2O_5, 6.3 per cent; and K_2O, 9.4 per cent greater than in 1951-52. While the amounts of nutrients consumed in materials were 17.4 and 15.6 per cent greater for nitrogen and K_2O, respectively, they were 5.8 and 2.8 per cent less for available P_2O_5, and total P_2O_5, respectively, than in 1951-52. Total primary nutrients consumed in 1951-52 and in 1952-53 were 5,203,003 tons (revised) and 5,648,016 tons, respectively, an increase of 445,013 tons or 8.6 per cent in comparison with the increase of 4.1 per cent for tonnage of fertilizers containing these nutrients. This reflects the trend toward higher analysis fertilizers as evidenced by consumption surveys made over the past ten years, and, as diagrammically shown in figure 1. The spread between the curves representing consumption of fertilizers containing primary nutrients and of that representing the nutrient content of the fertilizers has increased rapidly between 1949-50 and 1952-

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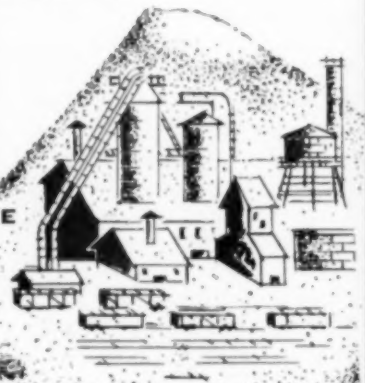
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53. During this period, the average nutrient content of fertilizers increased from 22.67 per cent in 1949-50 to 25.06 per cent in 1952-53; a rise in value of 2.39 in three years. While between 1943-44 and 1949-50, the average increased from 20.58 to 22.67 per cent; a rise in value of 2.09 in six years.

The primary nutrient content of fertilizers is based on the amounts of fertilizers reported herein and their average analyses as found by the fertilizer control officials of the respective state in which these fertilizers were consumed. Figure 2 shows the total tonnage of primary nutrients consumed in each region in comparison with consumption in 1950-51 and 1951-52. State consumption in relation to consumption in 1951-52 is shown by the index numbers, in per cent, in the last column of Table 1. These numbers are placed alongside the index numbers of fertilizer consumption. The difference in the numbers is an indication of the change in composition of the fertilizers.

Total consumption of primary nutrients in the New England region and the territories was approximately the same as in 1951-52 but was four per cent less in the East South Central region. In the West South Central region although the amount of fertilizer consumed was 5 per cent below that in 1951-52, the use of high analysis fertilizers resulted in a 2 per cent increase in the quantity of nutrients. Total nutrients consumed in all other regions increased from 4 to 30 per cent.

High analysis fertilizers have changed the order of highest consuming regions. Although, the total consumption of fertilizers is still the highest for the South Atlantic region where consumption amounted to 6,200,202 tons of primary nutrient bearing fertilizers (Table 5) in comparison with 5,099,353 tons in the East North Central region, the nutri-

Table 6. - Consumption of Primary Plant Nutrients in Fertilizers, Year Ended June 30, 1954[1]

State & Region	In Mixtures					In All Fertilizers				
	Nitrogen	P_2O_5 Available	P_2O_5 Total	K_2O	Total N, Avail. P_2O_5 & K_2O	Nitrogen	P_2O_5 Available	P_2O_5 Total[2]	K_2O	Total N, Avail. P_2O_5 & K_2O
Maine	10,730	41,775	52,757	25,092	80,971	13,169	43,882	54,430	25,092	82,651
New Hampshire	593	1,938	2,007	1,055	3,586	860	2,767	3,179	1,055	4,111
Vermont	1,410	4,185	4,335	2,040	7,635	1,220	4,000	7,340	2,040	10,260
Massachusetts	2,742	6,610	6,825	3,580	13,020	4,037	9,111	9,611	3,580	16,728
Rhode Island	705	1,014	1,131	1,207	2,926	1,674	1,882	1,947	1,207	3,760
Connecticut	5,270	5,801	6,320	5,370	16,479	4,375	8,277	9,656	5,370	18,377
New England	21,475	61,327	63,811	38,196	114,778	25,335	69,919	85,164	38,410	135,664
New York	47,817	58,975	81,402	60,316	132,108	34,027	80,660	98,152	60,363	181,606
New Jersey	12,000	28,870	27,742	14,880	43,757	10,344	27,098	27,510	23,040	60,972
Pennsylvania	26,158	73,696	76,588	33,372	109,921	31,479	85,214	94,351	33,372	177,930
Delaware	2,313	2,864	2,700	2,278	6,991	1,457	3,118	3,983	2,340	7,915
District of Columbia	111	205	207	153	527	140	219	236	153	512
Maryland	11,308	11,305	14,183	14,700	40,293	13,791	11,901	14,470	20,362	73,624
West Virginia	1,609	2,119	2,502	2,711	7,202	2,553	2,283	2,855	2,780	7,888
Middle Atlantic	76,316	178,034	215,324	170,410	460,327	103,219	189,791	245,174	174,009	567,399
Virginia	23,108	46,218	49,611	73,217	170,433	28,707	47,887	54,100	73,110	197,917
North Carolina	58,185	140,086	159,857	120,287	321,700	113,297	155,300	169,955	120,291	411,716
South Carolina	26,832	71,451	74,251	57,215	154,279	51,213	77,003	83,895	66,196	193,538
Georgia	43,899	108,797	119,260	91,591	281,747	71,474	114,841	130,241	89,811	293,526
Florida	38,869	73,321	79,078	61,277	214,897	68,809	79,499	93,819	69,474	231,782
South Atlantic	200,879	470,793	532,057	403,587	1,143,019	333,180	474,537	532,063	403,671	1,329,480
Ohio	58,203	134,784	148,196	120,267	334,003	91,816	141,167	156,466	130,249	377,916
Indiana	58,704	132,740	141,588	140,263	332,508	88,572	139,029	150,227	140,211	368,002
Illinois	29,100	61,411	67,005	55,813	206,186	74,009	120,316	129,844	104,601	307,707
Michigan	10,101	23,010	25,066	23,870	73,731	27,817	53,013	55,101	70,297	117,707
Wisconsin	12,173	21,170	22,839	21,707	127,158	17,070	52,961	53,705	54,052	119,138
East North Central	127,613	401,827	413,694	361,920	1,113,914	299,703	506,506	545,354	504,509	1,390,477
Minnesota	7,964	40,227	42,118	29,261	76,418	15,865	50,921	57,841	29,778	95,619
Iowa	20,666	64,256	69,079	31,334	115,256	44,612	84,154	94,738	31,340	154,298
Missouri	49,481	72,420	77,817	49,496	169,817	40,266	84,086	104,589	49,496	174,459
North Dakota	1,078	6,817	7,111	1,438	9,377	1,616	14,264	14,496	1,427	17,339
South Dakota	786	3,718	3,852	161	2,804	1,884	3,198	3,198	161	5,243
Nebraska	6,625	10,165	10,265	1,016	16,817	21,850	17,815	18,893	1,073	40,716
Kansas	10,803	11,004	26,356	5,370	20,054	2,217	67,221	73,670	5,310	81,596
West North Central	76,377	218,726	286,613	118,100	410,526	100,823	320,761	405,941	117,580	619,004
Kentucky	10,080	21,309	23,851	44,784	113,251	31,623	74,418	81,069	81,881	188,710
Tennessee	10,961	46,305	50,257	39,436	103,146	43,146	82,986	92,698	47,181	172,215
Alabama	31,732	84,543	91,868	67,218	180,772	77,974	111,418	121,198	69,414	197,166
Mississippi	10,151	31,851	34,600	24,077	75,128	102,781	92,037	98,432	24,751	177,160
East South Central	62,792	217,815	251,234	175,078	474,275	255,525	374,451	393,397	223,227	735,247
Arkansas	10,095	20,899	22,316	27,661	84,754	41,265	29,284	31,711	32,721	114,211
Louisiana	40,718	20,114	21,780	15,805	67,288	41,195	20,120	21,120	10,000	69,315
Oklahoma	5,812	9,005	9,868	3,803	18,815	8,761	21,833	27,325	3,315	39,809
Texas	16,287	34,774	36,616	18,816	69,823	53,286	75,956	84,756	19,837	154,858
West South Central	82,907	84,127	90,580	64,875	288,731	143,745	304,196	364,911	65,873	577,193
Montana	370	911	983	81	1,017	2,000	6,000	7,200	90	9,327
Idaho	1,664	1,800	1,997	1,330	5,091	5,861	11,953	12,953	257	18,511
Wyoming	240	671	713	43	1,070	1,150	2,919	3,092	84	4,326
Colorado	1,850	5,032	5,581	700	8,047	2,762	11,371	11,671	81	15,018
New Mexico	117	241	260	84	1,000	2,000	8,000	8,333	84	10,417
Arizona	2,000	3,037	3,271	140	5,740	29,267	11,000	11,000	714	41,981
Utah	202	501	554	107	857	2,022	3,261	3,640	166	5,833
Nevada	84	84	91	84	179	1,000	667	833	87	1,775
Mountain	6,466	12,298	13,237	2,589	26,989	45,260	54,201	58,826	1,761	111,870
Washington	2,211	3,950	4,018	2,000	8,023	23,867	11,867	12,667	2,720	30,254
Oregon	1,710	2,170	2,416	1,278	5,372	18,817	11,816	12,167	2,680	33,317
California	28,970	14,170	22,550	14,317	71,175	107,000	72,000	72,170	20,017	200,017
Pacific	32,891	21,019	28,984	16,617	84,571	207,684	96,683	96,833	25,421	323,938
Continental U. S.	667,471	1,755,979	1,911,982	1,545,353	4,987,345	1,565,854	2,280,885	2,740,157	1,704,211	6,229,696
Alaska	2,189	4,927	5,967	2,618	10,084	19,000	2,161	2,065	18,929	40,017
Hawaii	14,740	11,747	12,980	20,162	46,888	18,212	11,818	12,212	21,214	60,282
Puerto Rico	12,000	12,000	12,000	12,000	36,000	70	160	160	70	170
Alaska	15	15	15	15	30					
Territories	31,944	28,687	30,962	34,809	93,009	37,282	14,011	14,437	39,199	100,232
Total: 1952-53	699,415	1,784,666	1,942,944	1,580,162	5,080,354	1,603,136	2,294,896	2,754,594	1,743,410	6,329,928
1951-52	668,823	1,682,865	1,827,823	1,514,927	4,855,615	1,556,977	2,209,956	2,656,986	1,679,813	6,125,696
1950-51	582,888	1,541,865	1,687,823	1,514,927	4,855,615					

[1] Includes Government distribution.
[2] Includes, as available P_2O_5, 3 percent of the colloidal phosphate and 3 percent of the phosphate rock sarketed for direct application.
[3] Includes, as total P_2O_5, 22 percent of the colloidal phosphate and 22 percent of the phosphate rock marketed for direct application.
[4] Revised.

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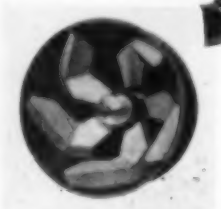


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Table 7. - Weighted Average Content of Primary Plant Nutrients in Fertilizers, in Percent, Year Ended June 30, 1953 1/

State & Region	Mixtures 2/				Materials					Total Nutrients in Mixtures and Materials
					Single Nutrient 3/			Multiple Nutrients 4/	Total Materials	
	N	Available P_2O_5	K_2O	Total Nutrients	N	Available P_2O_5 5/	K_2O			
Maine	4.32	10.81	12.89	30.02	30.47	20.01	50.64	11.22	21.71	29.60
New Hampshire	3.06	12.88	14.80	31.21	27.64	20.74	57.55	11.60	21.65	28.56
Vermont	3.10	11.81	17.06	31.97	29.82	20.47	56.90	11.61	21.67	29.71
Massachusetts	3.49	9.60	9.75	24.84	22.14	20.19	59.66	10.99	18.69	23.61
Rhode Island	3.29	9.84	10.24	23.36	19.90	19.25	58.70	10.80	16.93	24.19
Connecticut	3.80	8.66	9.81	22.29	20.84	21.03	51.44	11.21	17.21	21.75
New England	3.63	10.60	12.24	26.27	24.26	20.51	54.05	11.16	19.31	26.82
New York	4.38	11.38	6.85	23.81	28.01	20.30	48.84	10.08	20.41	24.54
New Jersey	3.06	10.88	9.96	23.58	26.82	18.23	56.96	10.22	21.16	24.27
Pennsylvania	4.30	12.11	9.84	26.25	25.52	19.37	55.44	10.86	19.51	25.16
Delaware	4.00	10.35	10.02	26.24	31.42	20.01	52.70	9.22	20.46	25.87
District of Columbia	3.64	10.32	6.25	22.21	19.69	20.71	58.62	9.04	11.46	19.68
Maryland	4.02	11.41	9.23	28.66	24.41	18.84	57.00	11.27	19.74	24.70
West Virginia	3.10	13.31	3.80	23.77	20.51	21.20	57.80	0.29	21.96	24.62
Middle Atlantic	4.02	11.36	8.81	23.70	26.01	19.49	54.50	11.29	19.94	24.06
Virginia	3.13	11.38	9.08	24.19	21.02	21.69	51.81	9.33	18.71	23.07
North Carolina	3.81	9.69	8.31	21.72	19.06	19.47	54.06	11.72	20.41	21.49
South Carolina	3.71	9.91	8.05	21.71	19.81	18.84	50.11	10.84	21.91	21.79
Georgia	4.08	9.14	8.24	21.62	21.38	19.19	47.61	11.22	21.63	21.49
Florida	0.27	6.99	7.80	15.16	20.80	8.98	47.62	15.98	19.89	20.13
South Atlantic	4.05	9.89	8.34	21.69	20.29	19.84	57.15	13.09	20.96	21.96
Ohio	3.83	11.47	11.24	27.91	28.10	16.99	50.49	9.86	22.42	27.45
Indiana	3.77	12.84	13.75	30.86	28.23	17.96	60.70	8.21	24.61	29.67
Illinois	4.53	12.63	14.82	31.98	34.16	4.96	58.06	14.60	13.49	30.89
Michigan	3.29	13.52	11.27	28.78	27.67	19.72	56.19	9.47	22.00	29.00
Wisconsin	3.29	14.38	16.54	32.67	36.31	8.74	54.65	9.16	20.61	34.23
East North Central	3.70	12.94	13.50	30.14	30.87	6.19	57.82	11.11	16.10	28.58
Minnesota	4.31	12.45	14.14	37.90	38.74	21.49	60.15	7.09	30.01	36.14
Iowa	3.39	16.98	8.89	31.44	32.40	19.39	59.12	10.30	28.66	29.95
Missouri	4.12	12.48	10.33	31.21	29.96	4.95	58.96	14.75	14.32	24.17
North Dakota	3.96	19.66	7.57	36.38	31.51	48.17	61.51	10.71	40.76	41.53
South Dakota	4.34	11.36	1.79	33.14	38.89	24.42	60.30	14.84	32.98	33.76
Nebraska	10.28	8.61	2.36	23.65	36.26	20.30	60.36	11.11	28.38	34.79
Kansas	9.35	10.75	0.35	34.46	35.75	21.36	60.34	11.74	30.12	34.90
West North Central	6.13	17.47	9.62	33.22	35.49	14.70	59.36	14.26	26.40	29.36
Kentucky	3.26	10.39	9.78	24.70	30.53	22.61	51.60	9.12	17.29	25.35
Tennessee	4.06	11.13	9.69	24.75	28.85	20.13	56.72	9.85	20.71	26.27
Alabama	4.22	9.38	7.80	21.72	22.73	18.11	53.45	10.20	18.10	20.52
Mississippi	3.70	9.52	7.17	22.39	20.70	19.75	53.41	11.94	17.97	20.63
East South Central	4.17	10.27	8.56	23.10	28.84	18.39	53.75	10.50	18.52	23.53
Arkansas	8.31	10.80	11.92	27.81	30.76	22.62	53.63	27.81	33.24	30.51
Louisiana	8.37	11.39	8.78	28.14	34.30	16.29	54.41	34.30	30.56	28.36
Oklahoma	8.31	15.46	8.78	34.93	32.64	26.39	53.19	40.19	32.58	33.30
Texas	8.76	12.48	8.64	26.66	29.07	21.63	59.39	34.93	29.96	27.30
West South Central	8.59	11.87	8.84	28.80	34.51	19.57	53.54	36.28	29.96	27.87
Montana	9.59	20.44	1.36	31.08	27.29	63.82	60.60	61.76	37.71	36.72
Idaho	13.63	14.98	1.72	28.37	28.78	31.08	60.96	39.69	29.30	28.28
Wyoming	11.94	22.32	1.82	35.46	31.67	39.16	60.90	51.71	36.97	36.89
Colorado	9.85	20.65	4.22	34.73	36.64	32.76	57.16	64.76	36.16	36.78
New Mexico	9.30	14.33	2.35	25.78	30.80	41.03	60.50	50.85	40.17	38.77
Arizona	10.80	14.27	2.38	27.32	37.52	37.85	60.22	54.91	36.98	36.38
Utah	7.91	14.30	3.27	26.17	27.96	32.30	59.31	34.76	27.39	27.30
Nevada	7.60	12.11	4.79	24.50	28.10	33.27	60.80	34.16	31.58	29.75
Mountain	10.15	16.36	2.70	29.39	32.76	37.29	60.62	52.75	34.87	33.93
Washington	7.31	12.76	9.77	29.84	40.46	27.28	59.76	28.47	30.12	34.91
Oregon	6.79	13.32	8.11	30.22	27.34	22.17	57.90	34.89	28.36	28.37
California	10.81	10.38	6.82	28.01	31.94	23.06	53.62	34.18	24.48	24.26
Pacific	10.38	10.86	6.80	27.08	32.18	23.24	56.01	15.80	23.96	26.22
Continental U. S.	4.51	11.61	9.86	25.80	28.04	18.47	51.67	21.68	22.14	25.30
Hawaii	10.36	0.33	16.34	35.22	28.71	16.79	58.26	64.33	33.09	34.06
Puerto Rico	11.95	6.47	9.01	26.88	32.37	28.28	59.12	20.66	22.97	26.30
Alaska	0.36	16.62	9.96	30.14	32.27	48.74	60.66	36.25	45.33	41.81
Territories	11.56	6.13	11.06	28.72	28.13	19.23	58.27	48.19	23.65	25.98
U. S. Average:										
1952-53	4.53	11.34	9.55	25.85	28.04	18.48	51.93	21.96	22.24	25.06
1951-52	4.50	11.14	9.41	24.85	r/ 27.96	14.71	49.90	20.97	r/ 21.16	r/ 24.04
1950-51	4.18	11.08	9.96	24.10	--	--	--	--	21.14	23.83

1/ Includes materials not guaranteed to contain N, P_2O_5, or K_2O.
2/ Guaranteed to contain two or more of the primary plant nutrients, N, P_2O_5, or K_2O.
3/ Guaranteed to contain only one of the primary plant nutrients.
4/ Includes the available P_2O_5 content of colloidal phosphate and phosphate rock as 2 percent and 3 percent, respectively.
r/ Revised.

ent content was but 1,337,048 tons (Table 6) compared with 1,342,877 tons in the East North Central region. The average nutrient content of fertilizers consumed in the South Atlantic region was 21.56 per cent (Table 7) in comparison with 26.33 per cent for the East North Central region. In terms of primary nutrients, this latter region is now the highest consuming area.★★

BARBERRY CONTROL

(*From Page 61*)

isolated from the rust on barberry as from the rust on grains and grasses.

The stem-rust epidemic of 1953 demonstrated once again just how important the development of new stem-rust races can be. Last year the hard red spring-wheat crop suffered damage estimated at 60 million bushels, and to the durum crop the loss was 25 million bushels. The damage to the oat crop in the Midwestern States totaled approximately 90 million bushels. Two races—15B of wheat stem rust and 7 of oat stem rust—were primarily responsible for those losses. These races were first identified in rust collections taken from rusted barberry leaves, and for a number of years were found only in barberry-infested areas. They apparently built up in those areas and eventually spread throughout the important grain-producing areas of the country.

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The stem-rust problem has been under attack on two fronts: Barberry eradication to eliminate the spring-host plant and plant breeding to develop rust-resistant varieties of small grain. More recently, scientists have been trying to find a chemical fungicide that can be applied as a dust or spray. No fungicide is now available for practical use, but the result of current research is encouraging. With a disease as important as stem rust, all control measures should be thoroughly exploited.

Over the years, as control measures have progressed, there has been a positive reduction in stem-rust losses. The loss trend is definitely downward, and average annual damage to the crop is less than 50 per cent of what it was 30 years ago. The benefits have been most noticeable in local areas where the barberry infestation was heavy. Oat yields in northwestern Pennsylvania increased 123 per cent after the barberry bushes were destroyed. Virginia farmers report a 68-per cent increase in wheat yields following the eradication program. In both states, only those farms on which there had been no change in varieties of grain or cultural methods following barberry eradication were selected for this comparison.

To find and eradicate all of the rust-spreading barberry bushes in the control states, comprising more than one million square miles, is an enormous undertaking. Even so, the costs of this work have been low. The average over-all cost, based on the total bushes destroyed, has been about five cents per bush. Another measure of cost and value that is more significant is expressed in terms of the total crop protected. In the 18 states, it has cost less than one cent per acre per year of small grain harvested for the barberry-eradication work accomplished to date.

Barberry eradication, when carried out to practical completion, will have eliminated permanently the early local source of stem-rust epidemics and the important source of new rust races. That is the direction in which the cooperating agencies are moving in the solution of one phase of this age-old problem. ★★

ENTOMOLOGY 100 YEARS

(*From Page 55*)

Thus, an abundant food supply nurtured the industrial development of this nation and its rise to a ranking world power. We became wealthy largely because of the development of our tremendous resources—possible only because there was enough to eat.

In 1863 Townend Glover became the federal entomologist in the newly established Department of Agriculture. His activities were mostly in the South where he studied pests of citrus fruits and other crops, chiefly cotton.

Fact is, the early interest in cotton insects is in a sense a contributing factor to what we know today as the county agent system. In 1902, the Division of Entomology of the U. S. Department of Agriculture conducted two field demonstrations on farms at Calvert and Victoria, Texas, involving some 325 acres of cotton. It was shown that by carefully selecting the seed, early planting, and thorough cultivation, cotton could be profitably produced in spite of the boll weevil.

This experiment amply demonstrated that cotton growers could live with the boll weevil. But Seaman A. Knapp, of the Bureau of Plant Industry, had learned from experience that farmers generally would not change their practices by observing what could be done on farms operated at public expense. Therefore, in 1903, at Terrell, Tex., Knapp directed a demonstration on the Walter C. Porter farm under typical cotton farmer conditions which netted a profit of some $700 extra on cotton and corn on 70 acres, despite insects, wind, and hail.

In 1904 funds provided from an emergency appropriation of $250,000 by Congress to combat the boll weevil made it possible for Knapp to demonstrate to cotton growers on a large scale, how to produce cotton under boll weevil conditions.

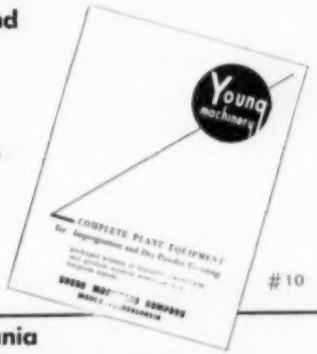
Shortly afterward, in 1914, the Smith-Lever Act was passed creating

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cooperative extension work. Provision for incorporating the Extension Service into the Department was made in the Agricultural appropriation of 1924.

This development created a greater need for entomologists who could work under field conditions with farmers. So, the Extension entomologist was born.

Again, a combination of factors had a bearing on the establishment of the county agent system. But at least insects and entomology had a key role and deserve a portion of the credit.

New York State pioneered many of the early developments in entomology, beginning with the appointment of Dr. Asa Fitch for the investigation of injurious insects in 1854. His teachings and work as State entomologist were influential in shaping policies of the entomological work in Illinois and Missouri as well as aiding in the development of the federal service under Townend Glover.

WHILE the entomologist opens the possibility of practical insect control through his knowledge of insects and their life cycles, it is the chemist and business man, who turn the possibilities into reality. They do it by producing and selling pesticides.

The growth of the industry can be divided into two periods—the first dates from the development of calcium arsenate through the early period of the Second World War, and the second from that time until the present.

Probably the first insecticide resulting from plan rather than accident was calcium arsenate. This became one of the most widely used of all insecticides and played a special role in the control of the boll weevil.

William C. Piver, typical of the enterprising young business-men in the industry conceived the possibility of producing calcium arsenate for use as an insecticide. His first experimental apparatus was hidden under his bed in a boarding house because his landlady wanted no poisonous or explosive chemicals in her house. Piver worked nights, and his progress was slow. There was little to guide him in the technical literature. In 1912 the first commercial batch of calcium arsenate was produced and shipped in powdered form to a dealer in Houston, Texas. The shipment was intended for the control of cotton leafworm. Use to control the boll weevil came later.

In 1915, Piver's company had 21 customers: in 1916, 55 customers. By then, the boll weevil was a serious pest in the cotton fields. In 1918, on the basis of government tests, a federal entomologist telegraphed Piver for 40 tons of calcium arsenate. This was his biggest order to date and a third larger than his highest yearly production. In spite of many difficulties, he filled the order!

Since then scores of companies have filled thousands of orders for calcium arsenate and the many other materials developed in the past decade.

Today many companies test 10,000 chemicals or more a year in search of effective new products. It is also estimated that 10 to 20 new agricultural chemicals are thoroughly studied for toxic hazards each year in the United States. Probably 500 to 1000 products each year receive some study through the early stages of development, but later are abandoned for a variety of reasons.

A recent sampling of 20 manufacturers showed that yearly expenditures for their research, including toxicological studies, is nearly 4 million dollars.

The industry has supported and does now endorse sound legislation for the protection of the public health and safety of the farmer, grower, and factory worker. New legislation now before the congress, concerning residue tolerances, should help to clarify matters and speed future industry development.

Industry research and development is being intensified as industry leaders seek to produce more products which will give entomologists new fields to conquer.

The growing problem of resistance to insecticides is typical of the many challenges facing entomologists.

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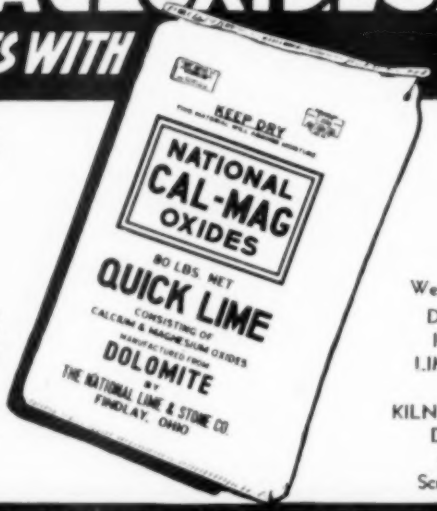
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CHEMAFETY

(*From Page* 48)

tainly be a strong warning to users of chemicals to pay attention to the cautions, and beware of the hazards.

As still another safety measure, a program might be launched on a national basis to urge all users of poisonous chemicals to provide a lock-up room for storing such materials. Suggestions could be given for the design of the room and the provision of appropriate ventilation. The lock-up room should, of course, be under lock and key as the name implies.

Greater publicity might also be given to the appropriate disposal of empty containers that formerly contained poisons. In brief, it might be suggested that all paper containers be burned in the field, and that operators keep out of the smoke while burning to avoid poison exposure. Empty metal containers should be buried or appropriately decontaminated at plants, depending on the nature of the poison.

Possibly one of the weak links in a safety educational program is the one of passing information on from the farmer to the farm help. To overcome this weakness, a series of bulletins might be printed in cartoon or picture style teaching the lesson of safety and the importance of following the directions. The farmer teaching his help how to handle a specific poison might also be characterized in such a presentation as a part of the safety program. Through the schools, 4-H clubs, and the like, safety could also be expanded, as a further means of reaching the farmer and bringing home the necessity for safe handling in the use and storage of poisonous chemicals.

With certain of the newer materials, the possibility of damage to the neighbor's crop or of poisoning the neighbor's cattle or bees is a vital factor. If the farmer can be thoroughly trained in these various hazards, the extent of such damage will certainly be tremendously minimized.

As still another point of the farmer training program, the importance of the farmer's knowing his doctor, his hospital, where the emergency ward is and what he will do and what each of his men will do if there is an accidental poisoning is a lesson to get over to the farmer as a means of improving safety in the handling and use of chemicals.

Looking at the safety problem from another angle, unless our industry does a good job in teaching safety and in enlisting the aid of other agencies to teach safety, sales of products may be curtailed due to adverse public opinion and restrictive legislation. Farmers will also lose profits because new chemicals have brought tremendous new wealth to agriculture. It's good business for agriculture and it's good business for our industry to think, practice and teach safety. Chemafety can save lives, time and expand the use of chemicals.★★

SAFETY PROGRAMS

(*From Page* 49)

is called "Look Out for Yourself When You Are Around CROP SPRAYING"; the other is titled "SAFETY for PILOTS". Both booklets describe and illustrate the hazards of agricultural pesticides, suggesting protective clothing and equipment, and first aid treatment in case of exposure.

A 48-page booklet by the California Farm Bureau Federation, "Safety on the Farm", reviews the various state laws concerning farm equipment and operations, workmen's compensation insurance, use, care and selection of equipment, and cautions against various accidents that may occur in daily farm routine. The booklet is typical of state publications on the safety programs.

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RESISTANCE PROBLEMS

(*From Page 47*)

lem might depend on the insect and the insecticide used.

Most entomologists and insecticide chemists agree that the resistance problem is one of the greatest handicaps in our efforts to hold our ground or advance in the fight against insects. It is causing them to take a new look at the problem of developing insect control measures. Fundamental research is considered a must. More rigid selection of chemicals may become necessary. More emphasis is given to research on cultural practices and the use of natural enemies as aids to pest control. Given the means to do the job, I am confident that they will continue to make progress in spite of the setback in controlling some of the pests that are now resistant to the newer insecticides.★★

CALIFORNIA FERT. ASSN.

(*From Page 52*)

north, is situated one of the three plants of the Naco Fertilizer Co., of California. In Part I of this series of articles, which appeared in the October 1952 issue of *Agricultural Chemicals* the San Francisco home office and the Los Angeles plant were covered, and the Madera plant was described in the second installment (May, 1954). John McGinley is the manager of the Santa Clara office. The plant was established in 1946 by Ralston-Purina Co. In 1947, this plant and the one located in Los Angeles were sold to a newly organized Naco Fertilizer Co. of California as the nucleus of its fertilizer mixing operations. Also in 1947, Naco constructed the Madera plant. An 80 ton per day Sturtevant mixing plant is the central feature of the Santa Clara operations. Naco's mixed fertilizers are sold all over California and Arizona under the brand names of "Naco", "Naco 5 Star", and "Challenge". These products, and a complete insecticide line as well, are sold largely through dealers, but in some areas direct to the farmer.

A. L. Castle Co., Mountain View, was established in 1923 by A. L. Castle. This concern formulates and sells complete lines of commercial fertilizers, insecticides and feeds. A flourishing seed business was added in the middle 1940's. Distribution is concentrated in the Southern San Francisco Bay area, though some items are sold throughout California, both direct and through dealers. Thomas S. and James Castle (sons of the founder) and Bernard Wilson, (a son-in-law), are currently active in management. A 40 ton per day Sturtevant dry mixing plant is employed to formulate the fertilizer mixtures.★★

(To be Concluded)

UREA HERBICIDES

(*From Page 45*)

Agitation requirements are much less critical for a liquid suspension such as "Karmex" DL herbicide, since it forms a relatively stable dispersion on dilution with water.

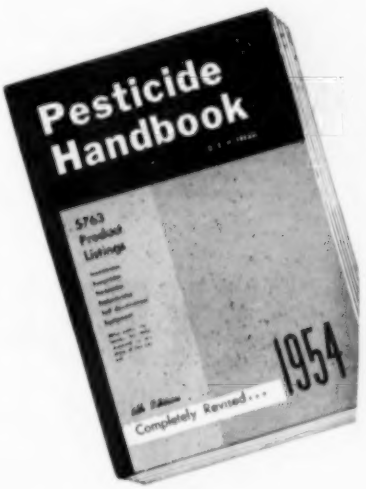
Non-Crop Uses in Agriculture

IN addition to crop uses of substituted ureas, there is increasing interest in the "soil sterilant" possibilities of these compounds in various agricultural operations. Their long-time effectiveness at relatively low dosages has made it possible to substantially reduce costs of cleaning up vegetation.

At rates of 20 to 80 pounds per acre, "Karmex" W herbicide is being used to control weeds around barns, silos, grain storages, machinery sheds, and in irrigation and drainage ditches. In the range of 60 to 120 pounds per acre, it can be used to "spot treat" small infestations of some perennial noxious weeds infesting cropland to prevent their spreading to other cropland areas. Crops may not grow on these treated areas for several years.

In irrigation ditches, "Karmex" W may be applied at one to two pounds per 1,000 square feet (40 to 80 pounds per acre) during the off-season, when the ditch is not in use

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about the editor—

Dr. Donald E. H. Frear, Editor of PESTICIDE HANDBOOK 1954, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition, he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State College.

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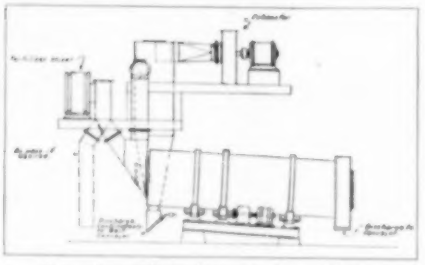
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for crops. Weed tops should be cut before treament, and matted vegetation on the ground should be removed so that spray will reach the soil. "Karmex" W herbicide must be fixed in the ditch soil by moisture, to minimize movement and avoid crop injury. If rainfall has not totalled four inches after spraying, then before the ditch is used for cropland irrigation, it should be filled with water, allowed to stand for 72 hours and then drained. This waste water should not be used on cropland.

Rainfall, soil type and plant species are three of the most important factors influencing the effect of substituted urea herbicides. These compounds work principally through the roots, rather than through the leaves, so they must be applied when there will be sufficient moisture to carry the chemical to the roots of the vegetation to be killed. Movement through the soil varies considerably with the soil type, so the effect on deep-rooted weeds may not show up until long after treatment.

With all herbicides, certain precautions are necessary. Do not spray weed killers on or near valuable plants or trees, or in areas into which their roots may extend. Do not treat locations from which the chemical may be washed into areas where roots of desirable plants may come in contact with the herbicide. Apply chemicals with care to prevent the spray or dry powder from drifting onto lawns, shrubbery, gardens, trees, or cropland. When working around irrigation systems, be careful not to contaminate the water with weed killer. Weed killers may also contaminate fertilizers, insecticides, fungicides, and seeds, so they should be kept separate. Sprayers which have been used for weed killers should not be used for spraying insecticides, fungicides or fertilizers on crops, ornamentals, lawns, etc. After you have used a "soil sterilant", be sure to clean the tank, pump, and all lines, booms and nozzles before using the same equipment to apply other weed killers to crops, lawns, or ornamentals.

Where definite recommendations have been established, the substituted urea herbicides can be used with confidence provided the recommended precautions are followed; and they promise to be some of the most versatile and powerful chemical tools working for American agriculture. ★★

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CENTENNIAL

(*Continued from Page 39*)

around the world would never have been possible.

Second, in the field of public health, entomology's contribution has been equally impressive. Entomological advances have succeeded in bringing under control such old scourges as typhus, malaria, sleeping sickness and scabies with the result that millions who would not have survived under conditions of a hundred years ago—are alive today to consume the increased food supply made possible by entomology — and to father tomorrow's still greater and healthier millions.

The anniversary which we celebrate this month is truly an important one—and one which the industry should take every opportunity to bring to the attention of the general public. If you haven't already done so, it isn't too late even now to make plans for tieing your company in with local programs for celebrating entomology's 100th birthday.

•

Wyandotte Names Buck

Royce P. Buck has been named field representative in the eastern district office of Wyandotte Chemicals Corp.'s M. A. Division.

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(*From Page 130*)

in an amount to give the desired equivalent of potash in the final product; adding, with continued mixing, dried material from the final step of the process in such quantity depending on the concentration of the nitric acid and aqueous ammonia employed to give a mixture having a water content of between 6% and 12% by weight; said mixture being then passed to at least 1 rotary drier in which the granulation is completed and the granules are dried by a counter-current stream of hot gas so that the temperature of the granulated material leaving the drier is not higher than 100° C.

2,674,527. HERBICIDAL COMPOSITIONS CONTAINING CHLORINATED ARYL ESTERS OF CHLORINATED ALIPHATIC MONOCARBOXYLIC ACIDS. Patent issued April 6, 1954, to Luther L. Baumgartner, Hastings-on-Hudson, N.Y., assignor to The B. F. Goodrich Company, New York, N.Y., a corporation of New York. A herbicidal composition which comprises as the essential active ingredient 0.01% to 10% by weight of a polychloroaryl ester of a chlorinated aliphatic monocarboxylic acid, said acid having from 1 to 6 carbon atoms and said polychloroaryl portion of the ester containing at least 3 chlorine atoms in the aryl nucleus and, as a carrier therefor, a mineral oil consisting predominantly of hydrocarbons containing 10 to 20 carbon atoms.

2,675,306. MANUFACTURE OF FERTILIZERS. Patent issued April 13, 1954, to Edward W. Harvey, Highland Park, and George L. Frear, Neshanic, N.J., assignors to Allied Chemical & Dye Corporation, New York, N.Y., a corporation of New York. A continuous process for preparing a nitrogen-phosphate base fertilizer, which comprises reacting phosphate rock composed essentially of particles of a size capable of passing a 100 mesh sieve, with an aqueous acid medium containing at least about 2 equivalents of H_2SO_4 for each 3 equivalents of any other acid for a period of about 5-10 minutes to convert substantially the entire phosphate content of the rock to H_3PO_4, the total amount of acid being at least 33% in excess of that theoretically required to effect such conversion to H_3PO_4, and the water content of the reaction mixture being 8 to 120 parts per 100 parts of phosphate rock, subjecting the resulting slurry comprising $CaSO_4$, H_3PO_4 and excess acid without any previous curing step, to reaction with ammonia in an amount of 6—8 mols per 10 equivalents of acid employed in acidulation, for a time sufficient to convert said H_3PO_4 essentially to dicalcium phosphate and ammonium phosphates, the ammoniation reaction reaching a maximum temperature of 25-180° C., recovering a fluid to plastic mass of material, drying and granulating said material, and obtaining as product a uniform, stable, free-flowing, granular fertilizer composition containing dicalcium phosphate, ammonium phosphates and ammonium sulfate.

Trade Mark Applications

GRO-STUFF, in capitals, for fertilizing materials both solid and liquid. Filed Sept. 18, 1952, by American Chemical Paint Co., Ambler, Pa. Claims use since July 9, 1952.

M-F-A in red and blue on shield with stars and stripes, for fertilizers, plant foods and soil conditioners. Filed March 6, 1953, by Missouri Farmers Association, Inc., Columbia, Mo. Claims use since Nov. 1, 1929.

F.T.E., white letters on black background, for friable glasslike substances in finely divided form containing essential plant foods for use as a fertilizer. Filed May 11, 1953, by Ferro Corp., Cleveland, O. Claims use since Aug. 15, 1952.

GROVE TESTED, in capitals, for fertilizers composed of phosphate, potash, magnesium and other organics. Filed July 1, 1953, by Dr. P. Phillips Fertilizers., Inc., Orlando, Fla. Claims use since Aug. 1, 1947.

PELLEFORM, in capitals, for fertilizers and soil conditioning materials. Filed Nov. 3, 1952, by Smith-Douglass Co., Inc., Norfolk, Va. Claims use since on or about Aug. 1, 1952.

E-Z-TIL, in shaded letters, for soil conditioners containing polyacrylonitrile. Original filed, act of 1946, Principal Register, Oct. 20, 1952; amended to application, Supplemental register, Aug. 21, 1953, by Mid-State Chemical Supply Co., Lindsay, Cal., assignor, by mesne assignments, to California Spray-Chemical Corp., Richmond, Cal. Claims use since Aug. 18, 1952.

PASTURGRO, in lower case letters, for plant food. Original filed, act of 1946, Principal Register, Sept. 11, 1952; amended to application, Supplemental Register, Oct. 28, 1953, by Swift & Company, Chicago. Claims use since July 10, 1952.

CALMONITE, in capitals, for nitrogen-containing fertilizers. Filed May 21, 1953 by Ruhr-Stickstoff Aktiengesellschaft, Bochum, Germany. Claims use since Jan. 3, 1953; and use in commerce between a foreign nation and the United States since Jan. 3, 1953.

SOILOAM, with "S" and "L" in capitals, for chemical compound in liquid form for improving soil such as clay or impacted soil. Original filed, act of 1946, Principal Register, June 25, 1952; amended to application, Supplemental Register, Dec. 18, 1953, by W. A. Cleary Corp., New Brunswick, N. J. Claims use since Apr. 30, 1952.

GARDEN KIST, with the word "Garden" disclaimed apart from the mark shown, for liquid fertilizer. Filed June 9, 1953, by W. W. Cade Sales Co., Los Angeles, Cal. Claims use since Jan. 26, 1953.

SWFGRO, in capitals, for fertilizers. Filed Aug. 24, 1953, by Southwest Fertilizer & Chemical Co., El Paso, Tex. Claims use since Apr. 1, 1950.

LUCKY LEAF, in script lettering, with drawing of a leaf, for insecticide-fungicide dust and spray. Filed Oct. 22, 1952, by Benjamin D. Smith Jr., Sanford, N. C. Claims use since January, 1951.

BRIGHT LEAF, in capitals, with drawing of leaf, for insecticide-fungicide dust and spray. Filed Oct. 22, 1952, by Benjamin D. Smith Jr., Sanford, N. C. Claims use since February, 1951.

STROBANE, in capitals, for chemical preparations to be used as insecticides. Filed Oct. 10, 1952, by the B. F. Goodrich Co., Cleveland. Claims use since July, 1952.

BES-KIL, in capitals, for livestock space spray. Filed July 10, 1953, by Besler Corp., Emeryville, Cal. Claims use since June 10, 1953.

FERRO-GRENE, in broken letters, for agricultural fertilizer. Filed Aug. 22, 1952, by Bersworth Chemical Co., Framingham, Mass. Claims use since July 3, 1952.

INTERNATIONAL Minerals & Chemicals, with word "International" in script and other words disclaimed apart, for phosphate rock concentrate for use as a fertilizer in the manufacture of mixed fertilizers, and for use in the preparation of superphosphate and triple superphosphate. Filed May 5, 1953, by International Minerals & Chemical Corp., Chicago, Ill. Claims use since Feb. 28, 1953.

PANA-LOAM, in capitals, on drawing of an ax, for soil conditioner. Filed Nov. 21, 1952, by Texas Panacalite Co., Dallas and Irving, Tex. Claims use since June 19, 1952.

FRUITONE, in capitals, for hormone in solid or liquid form useful for the treatment of plants, especially orchard plants. Filed June 15, 1953, by American Chemical Paint Co., Ambler, Pa. Claims use since Oct. 28, 1939.

VO-3, under crossed feathers, for chemical composition indicated for use as a soil conditioner and a fertilizer. Filed July 9, 1953, by Agricultural Mineral & Organic Compost Co., Alpine, Tex. Claims use since Feb. 10, 1953.

QUIX, in capitals, for chemical composition in concentrated form for use in production of insecticide sprays. Filed Sept. 14, 1953, by McLaughlin Gormley King Co., Minneapolis, Minn. Claims use since Aug. 14, 1953.

W.A.R.F.-42, in capitals, for rodenticide. Filed Sept. 14, 1953, by Wisconsin Alumni Research Foundation, Madison, Wis. Claims use since June 29, 1950.

CORO-SDD, for liquid fungicide. Filed Sept. 16, 1953, by Pittsburgh Plate Glass Co., Pittsburgh, Pa. Claims use since June 4, 1953.

S-W-F, on arrowhead, for insecticides. Filed Sept 21, 1953, by Southwest Fertilizer & Chemical Co., El Paso, Tex. Claims use since June 1, 1953.

HEXA-CHLOR, in open capitals, for insecticide preparation. Filed by S. Howard Eckley, doing business under the name Eckley Exterminators, Tyler, Tex. Claims use since Oct. 1, 1950.

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Index to ADVERTISERS

American Agricultural Chemical Co. 84
American Cyanamid Co. 38
American Potash & Chemical Corp. 122
Andrews, W. R. E. Sales, Inc. 95
Antara Chemical Div., General Dyestuff Corp. 74
Arkell & Smiths 28
Armour Fertilizer Works 146
Ashcraft-Wilkinson Co. 12
Atlas Powder Co. 10
Attapulgus Minerals & Chemicals Corp. 3

Baker, H. J. & Bro. 92, 93
Bagpak Div., International Paper Co. 25
Barber-Greene 154
Baughman Mfg. Co. ..... May
Bemis Bro. Bag Co. ..... 3rd Cover
Berkshire Chemicals, Inc. 141
Bradley & Baker 8
Bradley Pulverizer Co. 29

California Spray Chem. Co 104
Carbide & Carbon Chemicals Co. ..... Apr.
Chain Belt Co. 124
Chase Bag Corp. 75
Chemagro Corp. 118
Chemical Construction Corp. 15
Cohutta Talc Co. 162
Columbia Southern Chemical Corp. 80
Combustion Engineering, Inc., Raymond Division 36
Commercial Solvents Corp. 33
Continental Can Co., Shellmar Betner Div. 35
Cox, Dr. Alvin J. 159

Davies Nitrate Co., Inc. 145
Davison Chemical Co., Div. of W. R. Grace & Co. 23
Deere & Co., Grand River Chem. Div. 7
Diamond Alkali Co. 21
Doane Agricultural Service Inc. 158
James Doran Co. 162
Dorr Co. 34
Duval Sulphur & Potash Co. 12
du Pont de Nemours & Co., E. I. 79
Diversey Corp. 134

Eagle Picher Co. 148
Eastman Chemical Products, Inc. ..... May
Edco Corp. 158
Edwards Laboratory ..... May

Flint Steel Corp. 135
Floridin Co. 73
Fry Co., Geo. H. 143

Geigy Co. 70, 71
General Chemical Division, Allied Chemical & Dye Corp. 72
General Reduction Co. 134
Glendon Pyrophyllite Co. 147
B. F. Goodrich Chemical Co. ..... Apr.
Grace Chemical Co. ..... May
Grand River Chemical Division of Deere & Co. 7
Greeff & Co., R. W. ..... May

Hammond Bag & Paper Co. ..... May
Harcord Manufacturing Co. 108
Heckathorn & Co. 150
Hercules Powder Co. ..... 4th Cover
Highway Equipment Co. ..... May
Hough Co., Frank G. ..... Apr.
Huber, J. M. Corp. 68
Hudson Pulp & Paper Corp. ..... Apr.
Hypro Engineering Inc. 154

International Minerals & Chemical Corp. 67
International Ore & Fertilizer Co. 150

Jefferson Chemical Co. 78
Johns-Manville Co. ..... May
Johnson, C. S. Co. ..... May

K B H Corporation, The 6
Kraft Bag Co. 32

Lancaster, Allwine & Rommel 162
Lessman Mfg. Co. ..... May
Lion Oil Co. 76, 77

McDermott Bros. Co. 156
Marietta Concrete Corp. ..... Apr.
Mathieson Chemical Corp. ..... May
McDonnell, Dr. C. C. 159
McLaughlin Gormley King Co. 158
Michigan Chemical Corp. ..... Apr.
Mine Safety Appliances Co. 148
Monsanto Chemical Co. 11
Munson Mill Machinery Co. 146

National Agricultural Chemicals Ass'n. 128
National Aniline Div., Allied Chemical & Dye Corp. 106
National Lime & Stone Co. 152
Naugatuck Chemical Division, U. S. Rubber Co. ..... May
Neville Chemical Co. 85
Niagara Chemical Div., Food Machinery & Chemical Corp. ..... Apr.
Ninol Laboratories, Inc. ..... May
Nitrogen Div., Allied Chem. & Dye Corp. 18

Oldbury Electro Chemical Co. ..... May

Pacific Coast Borax Co. 24
Charles Page & Co., Inc. 142
Penick, S. B. & Co. ..... May
Pennsylvania Industrial Chemical Corp. 89
Pennsylvania Salt Manufacturing Co. 30, 98
Phelps Dodge Refining Corp. 136
Phillips Chemical Co. ..... May
Pittsburgh Coke & Chem. Co., Agricultural Chemical Div. 16
Planter's Fertilizer & Phosphate Co. 156
Pluess Staufer Co. 152
Potash Company of America 9
Powell, John & Co. ..... 2nd Cover
Prentiss Drug & Chemical Co. 86
Private Brands, Inc. 139

Raymond Bag Co. 100
Raymond Division, Combustion Engineering, Inc. 36
Republic Chemical Corp. 157
Republic Steel Corp. ..... May
Richfield Oil Corp. 154
Riedeburg, Theodore Associates 159
Riverdale Chemical Co. 110
Rohm & Haas Co. 90

Sackett & Sons Inc., A. J. 88
Shell Chemical Co. 37
Silver Creek Precision Corp. 112, 113
Southeastern Clay Co. 156
Southwest Potash Corp. 17
Spencer Chemical Co. 14
Spraying Systems Co. 160
Standard Agricultural Chemicals, Inc. ..... May
Stauffer Chemical Co. 96
Sturtevant Mill Co. ..... May
Summers Fertilizer Co., Inc. 144
Summit Mining Corp. 153
Synthetic Nitrogen Products Corp. 4

Tennessee Corp. 26, 97
Texas Gulf Sulphur Co. 126
Thayer Scale & Engineering Corp. 160
Thompson, Friar M. 159
Tobacco By-Products & Chemical Corp. 81
Townsend, Dr. G. R. 159

Ultra Chemical Works, Inc. 154
Union Bag & Paper Corp. 113
Union Special Machine Co. 27
Union Standard Equipment Co. 158
United Chemical Co. 150
United Clay Mines ..... May
Universal Detergents, Inc. ..... May
U. S. Industrial Chemicals Co. 120, 160
U. S. Potash Co. 69
U. S. Steel Corp. ..... Mar.
U. S. Phosphoric Products Div., Tennessee Corp. ..... Apr.

Vanderbilt Co., R. T. ..... May
Velsicol Corp. 22
Virginia-Carolina Chemical Corp. 81
Vulcan Steel Container Co. 133

Williams Patent Crusher & Pulverizer Co. 31
Willingham Little Stone Co. 156
Willson Products, Inc. 151
Wisconsin Alumni Research Foundation 160
Wolf's Agricultural Laboratories 159
Woodward & Dickerson, Inc. 144
Woudhuysen, H. L. & Associates 137
Wyandotte Chemical Corp. 116

Young Machinery Co. 149

Zonolite Co. 115

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The atomic age is well upon us, extending its effects most recently to a new atomic fertilizer plant at the Department of Agriculture's research station in Beltsville, Md. Government workers expect to produce one ton of the atomic fertilizer this year at a cost of $25,000. The radioactive fertilizer will be given away to agricultural research workers, for studies on how fertilizer affects plant growth.

* * * *

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* * * *

Expanded test plot work on a new systemic insecticide-fertilizer called "Fertox" is underway this summer, according to reports from International Xray Inc., Mobile, Ala. Company isn't ready to do much talking (patent applications still are pending) but it states USDA experimental registration has been granted and nearly 50 one-acre cotton testplots have been set up thoughout the South. Dr. H. L. J. Marshall, president, says one big goal is control of pink bollworm.

* * * *

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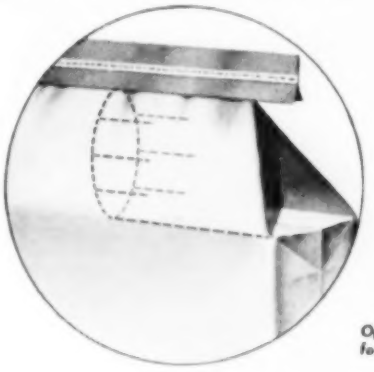
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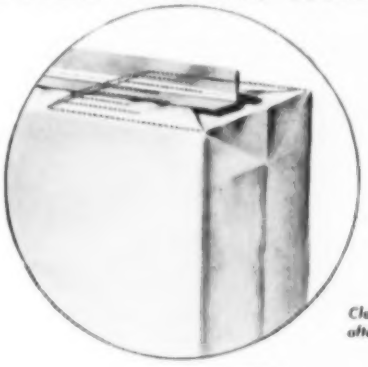
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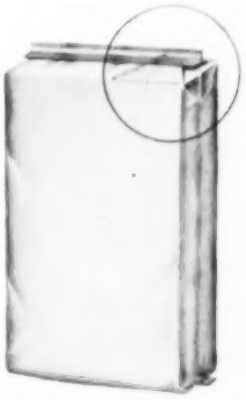


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